SD
11
.R1

Old-Growth Forest Types of the Northern Region

SD
11
.R1

NORTHERN REGION
USDA FOREST SERVICE
APRIL 1992
R-1 SES 4/92

OLD-GROWTH FOREST TYPES OF THE NORTHERN REGION

by

P. Green, J. Joy, D. Sirucek, W. Hann, A. Zack, and B. Naumann*

R-1 SES 4/92; USDA Forest Service, Northern Region, Missoula, MT 59807.
For additional information phone 406-329-3045 (FTS 585-3045).

*Authors are: Pat Green, Ecologist/Soil Scientist, Nez Perce National Forest, Grangeville, ID; John Joy, Ecologist, Deerlodge National Forest, Butte, Montana; Dean Sirucek, Ecologist/Soil Scientist, Flathead National Forest, Kalispell, MT; Wendell Hann, Ecologist, Northern Region USDA Forest Service, Missoula, MT; Art Zack, Ecologist, Idaho Panhandle National Forests, Coeur d'Alene, ID; and Bob Naumann, Regional Silviculturist, Northern Region USDA Forest Service, Missoula, MT.

CONTENTS Page

INTRODUCTION 1
ECOLOGICAL CONCEPTS RELATED TO OLD-GROWTH FORESTS 2
ECOLOGICAL STRATIFICATION FOR THE NORTHERN REGION 4
ANALYSIS PROCESS FOR CLASSIFYING OLD GROWTH TYPES 4
CORRELATION WITH ADJACENT REGIONS 11
USE OF OLD GROWTH TYPE DESCRIPTIONS 11
OLD GROWTH FOREST TYPE DESCRIPTIONS 13
NORTH IDAHO ZONE: 13
WESTERN MONTANA ZONE: 25
EAST-SIDE MONTANA ZONE: 33
LITERATURE CITED 45
APPENDICES 47

INTRODUCTION

In 1989, The Chief of the Forest Service established a National Old Growth Task Force and an action plan to deal with management of old growth forests. The action plan called for each Region to develop local definitions based upon a national generic definition of old growth. Regional definitions were not to be tied to resource values derived from old forests, but would be based on ecological attributes. In 1989, Region 1 named an old growth committee and set forth an action plan for meeting national requirements.

Many people do not see the National Forests as "working" forests, but rather believe old growth is the ultimate and desirable forest condition. Others believe old growth has value only as habitat for dependent or associated wildlife species. Old growth has an important role to play in forests managed for multiple resources. Region 1 views old growth as one element of the total diversity that should be found in a healthy forest landscape.

Region 1 old growth types were developed by three committees representing the major geographic areas of northern Idaho, western and eastern Montana. Each National Forest involved concerned publics as these definitions evolved. The Intermountain Research Station participated in this effort as well as interest groups from outside of the agency. The definitions have been coordinated with similar efforts in adjoining Forest Service Regions 4 and 6.

These definitions will be used in the implementation of Forest Plans. Where there are conflicts with existing plan requirements, differences will be worked out on a case-by-case basis. These definitiions will be used as Forest Plans are revised. They will constitute an important criteria for the current Regional effort of Sustaining Ecological Systems.

Both NFMA and WO direction prescribe an ecological approach to old growth that considers old growth as a key element in providing for biological diversity. Old growth dependent and associated species are provided for by supplying the full range of the diversity of late seral and climax forest community types that make up habitat for these species.

Past efforts at developing old growth definitions were generally applicable only to the area where they were developed, because they were not stratified based on site potential. Because of differing capabilities of the land, adequate and defensible old growth definitions should be based on a site potential stratification, such as habitat type, series, or habitat type groups. Otherwise, type descriptions will fail to adequately describe old growth across a variety of site conditions. As examples, stands with lots of 21" diameter trees could easily be produced on sites with hemlock and cedar potential in 90 years. On the other hand, many higher elevation subalpine fir sites could never grow a 21" tree. Multi-storied stands may be elements of old growth on many hemlock and cedar habitat types, but they probably are not natural on drier Douglas-fir or ponderosa pine habitat types.

Habitat types are based on the biological capability of the land to produce a given type of plant community at the endpoint of secondary successiion (climax). Normal timber management rotations do not extend long enough to produce climax plant communities, or sublimax late seral community types that would be part of a natural landscape. A biodiversity-based approach to old growth management seeks to maintain a relatively natural range of both climax plant communities and late seral subclimax communities. Both climax and late seral subclimax community types will be composed of stands with mixes and structural characteristics that are not commonly seen in current timber management regimes.

Ecological definitions of all successiional stages, stratification by habitat types, and other site conditions will help us do a better job of managing for a landscape with a full range of natural biological diversity.

As we inventory the landscape, we must gather enough hard data to provide for management needs and to improve our understanding of communities and their dynamics. The old growth types of this report are a first step in describing the successional stages for forest types of the Northern Region.

ECOLOGICAL CONCEPTS RELATED TO OLD GROWTH FORESTS

The term old growth has not been a well defined or common term in much of the forest ecology literature. The older stages of forest succession have typically been referred to as late seral, climax, mature, or overmature (Dansereau 1957; Daubenmire 1968; Kimmons 1987; Spurr 1964; Weaver and Clements 1938). The old growth stage is thoroughly discussed by Oliver and Larson (1990), with references to old growth dating back to the 1940s. Environmentalists have typically used ancient, primeval, and virgin forest as terms for the older stages of forest succession (Hunter 1990).

With the emergence of old growth as a management issue in the 1980s, that developed first in western Washington and Oregon, the literature has become prolific with discussions of old growth definitions and characteristics. Various definitions have been developed and used for the forests of Washington and Oregon (Franklin and others 1986; Franklin and Spies 1991; Marcot and others 1991).

Unfortunately the definitions and ecological relationships for forests of Washington and Oregon have often been extrapolated to the northern Rocky Mountains of Idaho and Montana. The ecological systems of the northern Rocky Mountains are significantly different than the Cascades, due to a variety of factors. Primary factors that differ include: a climate that is transitioning from marine to continental influences; an older land surface with complex geologic history and soil development; generally drier conditions with relatively frequent droughts and extensive fire; stand and fuel conditions that often result in running or creeping ground fire that does not kill the overstory trees; stressed sites that have significant insect and pathogen influences; and a different complex of biogeographic fauna and flora that have evolved in a very different system.

Based on Oliver and Larson (1990) true old growth would only include trees that have grown up without outside stand initiating disturbances. Transition old growth can contain large, old trees that are relics from stand initiating disturbances. This definition is promoted by Hayward (1991) in emphasizing that old growth should be restricted to stands that are influenced by within-stand processes. This narrow definition generally does not fit with stand development processes common to the northern Rocky Mountains. This is well documented by Achuff (1989) and Habeck (1988; 1990) in reviews of old growth forests. Old growth stands in the northern Rockies that proceed from a stand-consuming fire, through dominance by seral tree species, and then to climax are typically short lived, due to the high probably of crown fire. Many of the oldest stands of old growth are dominated by seral tree species that are maintained as dominants and protected from crown fire, by repeated underburns that reduce ladder fuels and competition from more tolerant tree species. These relationships are well documented by Arno and others (1985), Arno (1980), Fisher and Clayton (1983), and Fisher and Bradley (1987). In reviewing historic data it has recently been determined that the bulk of the presettlement upland old growth in the northern Rockies was in the lower elevation, ground-fire maintained ponderosa pine/western larch/Douglas-fir types (Losensky 1992). This does not mean that other types of old growth were not common or not important, but it emphasizes that the older stages of succession in the northern Rockies do not follow traditional old growth climax succession theory. In essence it provides solid support for more region-specific old growth definitions and understanding of ecological relationships.

As the old growth issue began to receive national attention, it became apparent that the definitions that had been developed for Washington and Oregon would not work for other geographic areas. This is reflected by Hunter (1987) who emphasized that there was no generally accepted definition, that the climax forest idea was too restrictive, and that old growth forests should be relatively old and relatively undisturbed by humans. Thomas and others (1988) emphasize that there is no single all-inclusive definition and that old growth characteristics vary by region, forest type, and local conditions. Hunter (1990) promotes that a universal old growth definition is not desirable and that forest ecologists should develop unique definitions for each forest type, taking into account forest structure, development, function, and patterns of human disturbance.

This general emphasis in the scientific literature for region and type specific definitions evolved into national Forest Service direction in 1989. This included a generic definition of old growth forests as "ecosystems distinguished by old trees and related structural attributes." Within the description old growth could encompass both seral fire-dependent species and tolerant, climax species. The national direction provided a list of general characteristics that "typically" distinguished old growth from younger growth.

Within the Northern Rockies various attempts at old growth definition were made during the Forest planning process. Unfortunately, these efforts continued to follow the definitions being developed in Oregon and

Washington or emphasized structural characteristics related to old growth-associated wildlife species. Pfister (1987) conducted the first quantitative analysis based on ecological data for the Northern Rockies. This effort concentrated on the Kootenai and Nez Perce National Forests and provided a structure for the analysis presented in this paper. The analysis provided a basic review of concepts and provided an ecologically based classification of old growth based on numbers of large trees, snags, and down logs and described associated attributes of layers, canopy cover, age, and basal area. Pfister (1987) provided eight recommendations for further analysis, some of which have been crucial in conducting the regional level analysis.

ECOLOGICAL STRATIFICATION FOR THE NORTHERN REGION

In order to classify old growth forests it was decided that the most applicable system for stratification of site potential would be groups of habitat types. The habitat type classification systems used for this grouping are the "Forest Habitat Types of Northern Idaho: A Second Approximation" (Cooper and others 1991) and "Forest Habitat Types of Montana" (Pfister and others 1977).

Habitat types were grouped using the interdisciplinary process. For each zone a group of ecologists, soil scientists, and silviculturists met and selected criteria for grouping similar habitat types. Criteria used for grouping included: similarity of disturbance response, potential productivity, potential stocking density, potential down wood accumulation, fire frequency, and tree species. These groups relate closely in environment with temperature and moisture regimes.

Appendix A, table 1 provides a listing of habitat type alpha and numeric codes for groups in Idaho, north of the Salmon River. Appendix A, table 2 provides a listing of habitat type alpha and numeric does for groups in Montana, west of the continental divide. Appendix A, table 3 provides a listing of habitat type alpha and numeric codes for groups in Montana, east of the continental divide. Due to differences in precipitation distribution, length of growing season, and floristic composition, the habitat types that occur in a given group will differ between geographic areas.

The old growth types for the Northern Region have been developed for three different geographic areas within the Region. The Region was geographically stratified into northern Idaho, western Montana, and eastern Montana. The Northern Idaho Zone is the western side of the northern Rocky Mountains in Idaho that is heavily influenced by pacific storms and weather patterns and generally received higher precipitation, especially in the winter, than areas to the east. The area generally north of Lake Coeur d'Alene has landforms designed by past continental glaciation, while the areas to the south have been primarily influenced by steep river downcutting and mountain glaciation. Northern Idaho is also heavily influenced by past volcanic events that deposited ash, which gives the soils relatively higher moisture holding capabilities.

The Western Montana Zone generally extends from the Bitterroot Mountain Divide to the Continental Divide of the Rocky Mountains in Montana. This area is influenced by pacific storms, with relatively high precipitation in the winter, but is also in the rain shadow of the Bitterroot Mountains. Some continental climatic influence also occurs and this area typically receives a higher percentage of precipitation in the summer than northern Idaho. Some areas in western Montana have soils developed on volcanic ash, but much less than in northern Idaho. The area north of Missoula has landforms designed by past continental glaciation while the areas to the south have been primarily influenced by glacial lake deposition, moderate river downcutting, and mountain glaciation.

The Eastern Montana Zone generally extends from the Continental Divide east to the eastern portions of the Rocky Mountains that occur near Billings and north to Lewistown and Great Falls. This area is strongly influenced by both a continental climatic influence and storms from the west. It lies in the rain shadow of the Rocky Mountains and receives much less precipitation than northern Idaho or western Montana. A relatively high percentage of the precipitation occurs in the summer. A minor percentage of the soils are influenced by volcanic ash deposition. A large percentage of the soils are developed on limestone parent material. Landforms north of Great Falls were generally developed through continental glaciation, while landforms to the south were generally developed as a result of mountain glaciation and gradual to moderate river downcutting.

ANALYSIS PROCESS FOR CLASSIFYING OLD GROWTH TYPES

For each geographic zone of the Region a committee was selected that included members from National Forest Systems, Forest Service Research, Universities, and the public. Each committee was chaired by a Forest Supervisor and had members from each National Forest that represented various disciplines. The committees also coordinated with adjacent Forests in other Regions. The R1-RO Ecology group provided coordination and leadership throughout the process and developed the computer analysis tools with the assistance of the Regional Timber inventory group. The committees conducted a preliminary analysis to develop the draft definitions presented in this report. Further refinement and development of descriptions will be conducted as more data is collected.

The concept of old growth was based on the National definition. In this definition old growth forests are considered ecosystems that are distinguished by old trees and related structural attributes. They encompass the later stages of stand development that typically differ from earlier stages in characteristics such as tree age, tree size, number of large trees per acre and basal area. In addition, attributes such as decadence, dead trees, the number of canopy layers and canopy gaps are important but more difficult to describe because of high variability.

The October 1989 Forest Service position statement on old growth recognized that "old growth forests encompass the late stages of stand development and are distinguished by old trees and related structural attributes . . ." and that " . . . specific attributes vary by forest type." Forest Service Regions were charged with developing forest type old growth definitions, and conducting old growth inventories.

Both biological processes and human values were considered to determine criteria for old growth. As stands develop and age, there are changes in ecological composition, structure, and function as well as changes in aesthetic and economic values. The point in that process of forest aging where a stand is classified as old growth is largely a function of human values and concerns. It's similar to the process of human aging. People change in real physical ways as they age. But, how old is considered old, depends upon whether you ask a 15 year old, a 40 year old, or a 70 year old person.

Forest Plans generally set timber rotations at approximately 100 years, plus or minus 2 decades. Old growth has become an issue because some people think that it might be in short supply. Therefore, our concern with old growth focuses on forests with tree ages and sizes, or stand structures significantly different thanwhat could be obtained in 100 years.

Plot data from the Northern Region stand exam inventory (USDA Forest Service R-1; 1989) were used as the basis for the old growth definition analysis. All plots that met a given set of criteria were used in the analysis.

The criteria for inclusion of a plot in the analysis were:

1. Plots were survey type 45 and 46, which meet full standard exam procedures.

2. Plots were selected from stands with no evidence of logging.

3. Plots had an identified habitat type.

4. The largest tree on the plot was greater than 100 years old and greater than 9 inches dbh.

5. The plot basal area for trees greater than 5" dbh was greater than 40 sf/acre.

A total of 680,000 plots were screened for the Idaho Panhandle, Clearwater, and Nez Perce National Forests in northern Idaho. A total of 1,068,000 plots were screened for the Kootenai, Flathead, Lolo, and Bitterroot National Forests in western Montana. A total of 388,000 plots were screened for the Lewis & Clark, Helena, Deerlodge, Beaverhead, Gallatin, and west side of the Custer National Forests in eastern Montana.

Habitat types are a land classification system based on the potential plant associations that will dominate a site at the end point of plant succession (climax). Habitat types are ideal for stratifying site conditions in order to predict the type of old growth forest they will produce. The plot data was sorted into groups of similar habitat types. Before a site reaches climax condition, it may be dominated by several different conifer tree species (with some associated structural differences), so plots in each habitat type group were subdivided by forest cover type (based on plurality of tree species basal area).

Within each habitat type group and forest cover type group, plots containing large trees over 100 years of age were selected for further analysis. The guiding principle was to select plots containing large, old trees that would represent the latter stages of stand development. These plots with large old trees were then further analyzed to determine the characteristics typical of old growth. These plots with old trees were analyzed for significant differences in tree ages, sizes, and forest stand structures and composition. Based on groupings of the data, and on professional judgment of the foresters, ecologists, and wildlife biologists, the following ages were selected as minimums:

North Idaho	
All types except lodgepole pine	150
Lodgepole pine	120
Western Montana	
Ponderosa pine, Douglas-fir, western larch	170
Lodgepole pine	140
Other types	180
Eastern Montana	
Douglas-fir types 1 and 2	200
Limber pine	120
Lodgepole pine	150
Subalpine fir type 10	135
Subalpine fir other types	160
Whitebark pine type 11	150
Whitebark pine type 12	135
Pondersoa pine	180
Douglas-fir type 3	180

The other minimum criteria -- tree size, and number of large trees per acre -- were selected to distinguish those stands where the old trees were dominating the stand structure. The number of trees over a given age and size (diameter at breast height) were used as minimum screening criteria for old growth. Associated characteristics (such as number of snags, down woody material, dead tops and decay, and diameter variation) represent the means, values, and ranges for structural characteristics found in the data for plots that met the old growth minimum criteria.

Three broad old growth stand structures were recognized in the analysis:

1. *Late Seral, Single-Story* -- these stands are still dominated by the tree species and tree canopy later that first captured the site after a stand replacing disturbance. The upper canopy is relatively closed. If understory trees were present, they are generally small, exhibit little growth, and do not form an apparent canopy layer. Other understory vegetation may be sparse. Ages and sizes of dominant trees are significantly beyond what may be found at culmination of mean annual increment of tree stand volume growth, growth rates are slowing, and tree crowns are showing signs of maturity or old age (flat, wide tops with slow main leader growth). This stage may have moderate amounts of tree decay, but little mortality, and few snags or pieces of down woody material.

2. *Late Seral, Multi-Story* -- the initial seral trees and canopy layer have lost control of the site. Disturbance or the natural mortality of age has produced holes in the upper canopy; shade tolerant understory vegetation and trees are increasing in crown volume; and shade tolerant understory tree species are growing towards the main canopy, and may have occupied part of it. Two or more canopy layers are obvious, the canopy may be irregular, and broken tops, bole rot, snags, and large down woody debris may be common. The stand may have small openings dominated by shrubs or understory forbs. Although there may be some very large or old individual trees, stand average diameter and age may be either greater or less than in the previous Late Seral, Single-Story stage. There is often great variation in average tree diameter.

3. *Near Climax* -- this stage is dominated by shade tolerant (possibly climax) tree species that captured the site after the initial seral stand has been largely replaced. A few remnant shade intolerant, early seral trees may persist, but they represent a small part of total live canopy. Depending upon overstory structure, there may be great variation in understory characteristics and tree diameter distributions. If the shade tolerant tree species are relatively short lived (such as subalpine fire), or only moderately long lived (such as grand fir), the canopy will be multi-storied, and contain significant numbers of snags and down woody debris. If the shade tolerant tree species is very long lived (such as cedar), there may be 1 dominant canopy layer, with relatively few snags or pieces of down woody debris.

The above 3 stages are generalities useful for explaining why an individual old growth stand may be expected to have, or not have, various structural characteristics sometimes identified with old growth in forest ecology

literature. Individual old growth stands may combine various elements of the above 3 stages, or may have some other unique characteristics as the result of particular site and stand history.

The plot data base was stratified by habitat type groups and forest cover types. The forest cover type was assigned to the tree species with plurality of basal area for trees greater than 9" dbh. Data from these plots on numbers of trees by 4" diameter size class, basal area, layers, snags, decay, broken tops, age, and crown ratio were graphed in various combinations, analyzed in frequency diagrams, and displayed in tables. Interdisciplinary team members from the zone committees and Forests then reviewed the output and identified minimum screening criteria for old growth for each habitat type group and forest cover type by Forest. Zone committees then met and grouped this data into minimum criteria for screening stands for old growth.

The minimum screening criteria can be used to identify stands that may meet the old growth type descriptions. Type descriptions are presented in a later section of this report. The screening criteria are presented in tables 1, 2, and 3 for the north Idaho, western Montana, and Eastern Montana zones respectively. In the tables the column headings are defined as follows:

Old Growth Type - the type is a group of forest cover types that have similar characteristics relative to size, number and age of dominant overstory trees. The forest cover types are identified with the following codes: PP - ponderosa pine; DF - Douglas-fir; L - western larch; LP - lodgepole pine; Y - western yew; GF - grand fir; SAF - Engelmann spruce and subalpine fir; WH - western hemlock; WP - western white pine; MAF - mountain hemlock, alpine larch, and subalpine fir; WBP - whitebark pine; C - western redcedar; PF - limber pine.

Habitat Type Group - Habitat types are grouped differently according to geographic zone. The letters identify the zone habitat type groups displayed in Appendix A. Habitat type groups are grouped into larger groups based on similarity of temperature and moisture regimes within each zone.

Minimum Age of Large Trees - This is the minimum average age for the largest size class for the old growth type.

Number TPA/DBH - Number of live trees per acre greater than a given dbh level. This would be the minimum number of live trees per acre greater than a set dbh level.

Minimum Basal Area - the minimum basal area in square feet for trees greater than 5" dbh.

DBH Variation - variation in diameter of trees greater than 5" dbh. The variation is classed in L = low (+ 0-20%), M = moderate (+ 21-40%), and H = high (+ 41-100%).

Percent Dead/Broken Top - the percent of trees greater than 5" dbh. with dead or broken tops.

Probability of Down Wood - the probability that abundant down wood will be present. Probabilities are classed into L = low (+ 0-20%), M = moderate (+ 21-40%), and H = high (+ 41-100%).

Percent Decay - the percent of trees greater than 5" dbh with significant decay.

Tree Canopy Layers - an indication of the number or variation in numbers of tree layers that can be expected. SNGL = single layer; MLT = multiple layers.

Snags > 9" - range in number of snags (dead standing trees) > 9" diameter.

No. of Samples - this is the number of plots from the plot data base that met the screening criteria and are used in the old growth type descriptions.

TABLE 1 NORTHERN IDAHO ZONE OLD GROWTH TYPE CHARACTERISTICS

OLD GROWTH TYPE	HABITAT TYPE GROUP	MINIMUM AGE OF LARGE TREES	MINIMUM NUMBER TPA/DBH	DBH VARIA-TION 2/	PERCENT DEAD/BROKEN TOP 1/	PROB-ABILITY OF DOWN WOODY 2/	PER-CENT DECAY 1/	NUMBER CANOPY LAYERS 3/	SNAGS	NUMBER OF SAMPLES
1 – PP, DF, L	A,B	150	8 > 21"	M	0-30	M	0-8	SNGL/MLT	0-7	815
2 – LP	B,C,D,G,H,I ,J	120	10 > 13"	M	0-19	M	2-13	SNGL/MLT	1-37	875
3 - Y	C,C1	150	3 > 21"	M	7-10	H	9-34	SNGL/MLT	5	26
4 – DF, GF, L, SAF, WH, WP	C, C1,D,E,F, G,G1,H,I	150	10 > 21"	M	0-28	M	1-4	SNGL/MLT	1-3	14,421
5 – SAF,MAF	F,G,H,I	150	10 > 17"	H	5-36	H	5-28	MULTIPLE	6-36	4,275
6 – WBP	I,J	150	5 > 13"	M	0-17	M	6-17	SNGL/MLT	11-42	43
7 – C	F,G,G1	150	10 > 25"	M	5-36	M	6-55	SNGL/MLT	6-47	5,865
8 – DF,L,SAF, MAF,WP	J	150	10 > 17"	M	1-14	M	1-15	SNGL/MLT	3-40	890
9 – SAF,MAF	K	150	5 > 13"	H	21-23	M	13-35	MULTI	11-13	26

1/ These values are not minimum criteria. They are the range of means across plots within forests, forest types, or habitat type groups.

2/ These are not minimum criteria. They are Low, Moderate, and High probabilities of abundant large down woody material or variation in diameters based on stand condition expected to occur most frequently.

3/ Number of canopy layers can vary within an old growth type with age, relative abundance of different species and successional stage.

TABLE 2 WESTERN MONTANA ZONE OLD GROWTH TYPE CHARACTERISTICS

OLD GROWTH TYPE	HABITAT TYPE GROUP	MINIMUM AGE OF LARGE TREES	NUMBER TPA/DBH	DBH VARIA-TION 2/	PERCENT DEAD/BROKEN TOP 1/	PROB-ABILITY OF DOWN WOODY	PERCENT DECAY	NUMBER CANOPY LAYERS 3/	SNAGS	NUMBER OF SAMPLES
1-PP,DF,L	**A-1,B-1**	**170**	**8 > 21"**	M	12 3-32	L-M	5 0-11	SNGL	6 0-22	4,847
2-DF,L	**C-1**	**170-**	**8 > 21"**	H	11 0-21	M	5 2-12	MLT	7 2-37	2,505
3-LP	**C-1,D-1,E-1,F-1,G-1,H-1**	**140**	**10 > 13"**	L	11 5-22	H	6 2.15	SNGL	19 0-92	2,648
4-SAF,DF, GF,C,L	**D-1, E-1,F-1**	**180**	**10 > 21"**	H	95 0-19	H 2-43	9 0-19	MLT	15 2-43	13,867
5-SAF,DF-GF, L	**G-1,H-1**	**180**	**10 > 17"**	M	9 1-18	H	6 0-12	MLT	12 3-36	4,053
6-SAF,WSL	**I-1**	**180**	**10 > 13"**	M	11 2-31	M	10 2-17	MLT	25 5-38	255
7-LP	**I-1**	**140**	**30 > 9"**	L	87 3-14	H	5 0-11 9-22	MLT	17	95
8-SAF,WSL	**J-1**	**180**	**20 > 13"**	M	12 10-14	M	5 0-8	SNGL	37 33-40	14

1/ These values are not minimum criteria. They are the range of means across plots within forests, forest types, or habitat type groups.

2/ These are not minimum criteria. They are Low, Moderate, and High probabilities of abundant large down woody material or variation in diameters based on stand condition expected to occur most frequently.

3/ Number of canopy layers can vary within an old growth type with age, relative abundance of different species and successional stage.

TABLE 3 EASTERN MONTANA ZONE OLD GROWTH TYPE CHARACTERISTICS

OLD GROWTH TYPE	HABITAT TYPE GROUP	MINIMUM AGE OF LARGE TREES	NUMBER TPA/DBH	DBH VARIA-TION 2/	PERCENT DEAD/BROKEN TOP 1/	PROB-ABILITY OF DOWN WOODY 2/	PER-CENT DECAY 1/	NUMBER CANOPY LAYERS 3/	SNAGS	NUMBER OF SAMPLES
1 – DF	A	200	4 > 17"	M	4>	L	4>	SNGL/MLT	4-18	989
2 – DF	B,C,D,E,F,H	200	5 > 19"	M	2>	L	3>	SNGL/MLT	3-29	3,439
3 – DF	G	180	10 > 17"	M	2>	M	6>	SNGL/MLT	15-50	18
4 – PP	A,B,C,K	180	4 > 17"	M	5>	L	3>	SNGL/MLT	5-10	92
5 – PF	A,B	120	6 > 09"	M	0>	L	0>	SNGL/MLT	6-24	24
6 – LP	A,B,C,D,E, F,G,H,I	150	12 > 10"	L	0>	L	0>	SNGL/MLT	3-56	9,633
7 – SAF	C	160	12 > 17"	M	1>	H	18>	SNGL/MLT	50	8
8 – SAF	D,E	160	7 > 17"	M	0>	L	1>	SNGL/MLT	0-44	664
9 – SAF	F,G,H,I	160	10 > 13"	M	0>	M	0>	SNGL/MLT	20-59	1,360
10 – SAF	J	135	8 > 13"	M	2>	L	0>	SNGL/MLT	8-84	38
11 – WBP	D,E,F,G,H,I	150	11 > 13"	M	0>	L	2>	SNGL/MLT	0-65	953
12 – WBP	J	135	7 > 13"	M	0>	L	3>	SNGL/MLT	0-34	173

1/ These values are not minimum criteria. They are the range of means across plots within forests, forest types, or habitat type groups.

2/ These are not minimum criteria. They are Low, Moderate, and High probabilities of abundant large down woody material or variation in diameters based on stand condition expected to occur most frequently.

3/ Number of canopy layers can vary within an old growth type with age, relative abundance of different species and successional stage.

CORRELATION WITH ADJACENT REGIONS

Old growth types were correlated across regional boundaries with Region 6 (Washington and Oregon) and Region 4 (southern Idaho and Wyoming). Meetings were held with regional representatives on June 11, 1991 in Spokane, Washington and on October 4, 1991 in Missoula, Montana. Most definitions correlated fairly well. Region 6 will use R-1's definitions for seral cover types in eastern Washington and Oregon. A summary of the notes is given in Appendix B.

USE OF OLD GROWTH TYPE DESCRIPTIONS

Forest stand composition and structure is a function of site physical characteristics (soil, climate, topography), the particular history of that site, the characteristics of the species that occupy the site and their interactions, and the physical and biological forces that affect the site during successional development. The rugged, mountainous topography of the Northern Region is overlain with a complex climate produced by the west to east intersection of the pacific Marine climate with the Great Plains Continental climate. There is great annual variation in both temperature and moisture, and there is a large amount of variation from year to year around the long term averages for any given date or month. There is also great variation in type and severity of disturbance mechanisms, both natural and man caused. The result of this variety of forces that shapes individual stands, is a wide variation in the resulting stand structures. No set of generated numbers can capture all the variation that may occur at any given age or stage in forest development.

Because of the great variation in old growth stand structures, no set of numbers can be relied upon to correctly classify every stand. In addition, the uncertainties of sampling and statistics introduce another need for caution in using stand data. The minimum criteria in the "tables of old growth type characteristics" are meant to be used as a screening device to select stands that maybe suitable for management as old growth, and the associated characteristics are meant to be used as a guideline to evaluate initially selected stands. They are also meant to serve as a common set of terms for old growth inventories. Most stands that meet minimum criteria will be suitable old growth, but there will also be some stands that meet minimum criteria that will not be suitable old growth, and some old growth may be overlooked. **Do not accept or reject a stand as old growth based on the numbers alone; use the numbers as a guide.**

A stand dominated by trees of the age and size listed under minimum criteria is generally good potential old growth. The number of trees is meant as a guideline for how many trees it takes to produce older stand characteristics, and should not be used as an absolute. The large tree age listed under minimum criteria is meant to define the minimum age which we will consider old growth, but that age is difficult to measure because some of the oldest trees may be too rotten or too large to accurately age. For this and other reasons, although age is the single most valuable guide for determining when a stand is old growth, age is often the least reliable data in an inventory. Tree size generally increases as a tree ages, but stand density and mortality affect tree size. The associated characteristics listed in Table 1 through 3 are meant to be guidelines in evaluating stands. A stand should not be accepted or rejected as old growth simply on the basis of associated characteristics. The predominance of minimum criteria and associated characteristics, rather than a single number, generally will be an excellent guide. Be aware that the associated characteristics of "DBH variation" and "tree canopy layers" were only provided as a descriptor of what was most common in existing inventory data, and should not be used to decide whether a stand is really old growth. Use these numbers and descriptions as guides in applying the basic principle that old growth is a "late stage of stand development" . . . " dominated by old trees and related structural attributes."

Where stand examination data is available, this data may be compared to the old growth minimum criteria in Tables 1 through 3, by habitat type group and forest cover type. Run Code 22 on the Forest Service Region 1 "R1EDIT Menu" (available in all Forest Service Region 1 Data General computers in the R1EDIT Program Package) is designed to extract potential old growth stands from the R1EDIT stand exam data base. Run Code 22 is an interactive program that allows a user to specify a group of habitat types and forest cover types, and specify the minimum criteria of number of trees, minimum age, and minimum diameter. The program will then return a list of stands from the R1EDIT data base that meets the specified characteristics, and will give some summary data for each stand. A separate Run Code 22 extract will be needed for every combination of habitat types and forest cover types that has unique characteristics.

The minimum criteria are used to determine if a stand is potentially old growth. Where these values are clearly exceeded, a stand will usually be old growth. The associated structural characteristics may be useful in decision making in marginal cases, or in comparing relative resource values when making old growth evaluations.

In a few cases of multi-species stands, the forest cover type automatically assigned by the stand exam system may be misleading when trying to make an old growth determination. For example, in a multi-species stand, cedar may only have 25% of the stand basal area, and still be assigned the forest type, because it has more basal area than any other single species. The old growth cedar forest type requires diameters larger than other species, and even a very old stand, with only 25% cedar, may not have enough large cedar to meet the cedar minimum old growth criteria. However, if the same stand was assigned a cover type of any of the other species that make up 75% of its basal area, the stand would meet old growth minimum criteria. For this reason, if the forest cover type has an old growth minimum criteria that's different from the majority of species for that habitat type, it is recommended that this forest type not be assigned for old growth determination, unless it represents 50%+ of the stand basal area. This adjustment will have to be made manually, on a stand-by-stand basis for the cedar, lodgepole, and SAF-MAF forest types.

In addition to using old growth minimum criteria with the stand exam data base R1EDIT Menu, Run Code 22 for extracting potential old growth stands, additional Run Code 22 extracts with stepped down standards are recommended. These step down runs are useful to extract stands that are either close to being old growth, or are actually old growth, with an inclusion of younger or smaller trees that skews the data. This step down procedure may also identify old growth blocks within larger stands. Step down runs can be done with the minimum criteria backed off slightly (use 1" smaller minimum diameter, or 10 year lower age, or 1-2 fewer trees per acre; possibly do several iterations, each backing down 1 more step).

Because old trees are often rotten and difficult to age, it is recommended that 1 step down version of Run Code 11 be done with a zero age criteria to extract stands where this may be a factor. Careful further evaluation will be needed for any stands extracted with a zero age criteria, since many of these stands will not be old growth.

Where no in-place stand exam data exists, but a site was visited by a professional interdisciplinary team in previous environmental analysis, the notes and determinations of that interdisciplinary team may be used in deciding whether to consider the stand old growth. Be aware that some interdisciplinary teams may have allocated young stands of old growth to meet predetermined acreage targets, and some of their stands may not meet the type descriptions.

These old growth minimum criteria, associated characteristics, and descriptions were developed to apply to individual stands. When applying these standards, 3 things need to be remembered. First, these numbers represent averages and ranges that either existed in the inventories, or were assigned by professional judgment. While they are good guides, they are not absolute. Because of the innumerable combinations of site characteristics and historical factors that can occur, no set of numbers will correctly define every possible situation. The basic concept is that old growth should represent "the late stages of stand development . . . distinguished by old trees and related structural attributes."

The second point is that old growth is valuable for a whole host of resource reasons such as habitat for certain animal and plants, for aesthetics, for spiritual reasons, for environmental protection, for research purposes, for production of unique resources such as very large trees. Unusual natural communities, etc. The resource values associated with potential old growth stands need to be considered in making allocations.

The third point to bear in mind when evaluating old growth is that a stand's landscape position may be as important, or more important than any stand old growth attribute. The landscape is dynamic. We need to do more than draw lines to manage this dynamic system. Consider the size of old growth blocks (large blocks have special importance), their juxtaposition and connectivity with other old growth stands, their topographic position, their shapes, their edge, and their stand structure compared to neighboring stands. Stands are elements in dynamic landscape. We need to have representatives of the full range of natural variation, and manage the landscape mosaic as a whole in order to maintain a healthy and diverse systems.

At the same time, there may be some stands with trees so large or so old that they are unique. We should always maintain a good representation of these very old unique and outstanding stands, because they are irreplaceable within human life spans. Remember to value the truly unique and outstanding, wherever it may be.

OLD GROWTH FOREST TYPE DESCRIPTIONS

NORTH IDAHO ZONE:

Old Growth Type 1
Ponderosa pine, Douglas-fir, Western Larch Forest Types
on warm, dry environments

Habitat Type Groups
Ponderosa pine and Douglas-fir habitat types
North Idaho Zone Groups A and B
This type is moderately well represented across all of the 3 National Forests, but is most abundant in the southern part of the North Idaho Zone. This zone includes the Clearwater, Idaho Panhandle and the Nez Perce National Forests.

Forest Types
Douglas-fir and ponderosa pine are major forest types. Western larch is a minor forest type.

Minimum Characteristics
8 trees per acre 21 inches DBH or more
Large trees 150 years old or more
Sample size: 815 Plots

Site Description
This old growth type occupies warm, dry environments on predominantly steep southerly aspects at elevations from 1000 to 6000 feet. It is on north aspects at lowest elevations. Ponderosa pine is the climax dominant on the driest sites and Douglas-fir on moister sites in these groups. Bunchgrass dominated understories are the least productive, typically with relatively low stocking. Habitat types where shrubs dominate the understory can support greater tree stocking. Prior to 1900, cool underburns at intervals of 5 to 25 years promoted open stands, while hotter stand replacing fires occurred at intervals of 150 to more than 300 years.

Vegetation Characteristics
This type may be single or multistoried. A single canopy layer is most common during seral stages, or in climax ponderosa pine. Large ponderosa pine dominate ponderosa pine habitat types under seral and climax conditions, and pine is a seral dominant on Douglas-fir habitat types. Douglas-fir may be a seral or climax dominant on Douglas-fir habitat types. Larch is a seral dominant on the more moist Douglas-fir habitat types. This old growth type can maintain old growth characteristics for moderate periods in seral stands and for long periods where ponderosa pine or Douglas-fir are climax on the site.

The average age of the largest trees in this type is 225 years, with a range from 208 to 256. Individual trees may reach an estimated age of 475 years. There are an average of 24 trees per acre 21 inches DBH or more. The range of means across forests and forest types is from 18 to 20 on habitat types with dry bunchgrass understories and 19 to 27 on habitat types with shrub understories. The average basal area is 122 ft^2 per acre on sites with bunchgrass understories. The range is 89 to 124 ft^2. On moister sites with shrub understories, the average basal area is 164 ft^2 per acre and ranges from 147 to 193 ft^2.

The average number of dead standing trees 9 inches or more DBH is 5 with a range of 0 to 13. The average percent of trees 9 inches or more DBH with dead or broken tops is 9 with a range of 0 to 30 in means across forests and forest types. The average percent of trees showing decay is 6, with a range of 0 to 8. The probability of rotten, down log pieces 9 inches or more in diameter is low to moderate. Average litter and duff depth is 1 inch or less.

NORTH IDAHO ZONE:
Old Growth Type Code 2
Lodgepole pine forest type
on cool and cold environments

Habitat Types, Groups, and Geographic Distribution
Douglas-fir, grand fir, western red cedar, mountain hemlock, and subalpine fir habitat types. Subalpine fir and mountain hemlock habitat types with clintonia or menziensia in the understory are best represented.
North Idaho Zone Groups B, C, D, G, H, I, J
This type is well represented across all of the 3 National Forests in this zone. These Forests include the Clearwater, Idaho Panhandle and the Nez Perce.

Forest Types
Lodgepole pine

Minimum Characteristics
10 trees per acre 13 inches DBH or more
Large trees 120 years old or more
Basal area 60 ft^2 per acre or more
Sample size: 875 plots

Site Description
This old growth type occupies cool and cold environments on all aspects at elevations from 2000 to 7000 feet or more. It is in areas of cold air impoundment at lowest elevations. Douglas-fir is the climax dominant on the driest sites, grand fir on cool, moist sites, and subalpine fir on cold moist sites in these groups. Western hemlock and western red cedar are climax on cool sites that are more moist than those that support grand fir. Bluejoint, grouse whortleberry and pinegrass dominated understories are the least productive, typically with relatively low stocking. Habitat types where clintonia, wild ginger, or menziesia dominate the understory are more productive and can support greater tree stocking. Prior to 1900, repeated fires at less than 100 to 150 years favored the occurrence of large stands of nearly pure lodgepole pine. These pure stands are frequently overstocked and potential centers for disease and insect epidemics.

Vegetation Characteristics
This type may be single or multistoried. A single canopy layer is most common in stands of pure lodgepole pine. Multiple canopy layers are more common in stands of lodgepole pine and large trees of other seral species, such as Douglas-fir. Large lodgepole pine dominate these several habitat types where cold and frequent fire favor its occurrence as a seral species. This old growth type can maintain old growth characteristics for short periods until it is replaced by late seral or climax species.

The average age of the largest trees in this type is 173 years, with a range from 151 to 194. Individual trees of more long lived species may reach an estimated age of 347 years. There are an average of 81 trees per acre 13 inches DBH or more. The range of means across forests and forest types is from 15 to 64 on Douglas-fir, grand fir, and subalpine fir habitat types with beargrass or grouse whortleberry understories to 192 on moist subalpine fir habitat types with clinitonia or menziesia understories. The average basal area is 171 ft^2 per acre. The range is 148 to 215 ft^2. Low basal areas are associated with the drier and colder environments in this old growth type.

The average number of dead standing trees 9 inches or more DBH is 24 with a range of 1 to 37. The average percent of trees 9 inches or more DBH with dead or broken tops is 9 with a range of 9 to 19 in means across forests and forest types. The average percent of trees showing decay is 7, with a range of 2 to 13. The probability of rotten down log pieces 9 inches or more in diameter is moderate. Average litter and duff depth is 1 to 2 inches.

Undescribed Types
Lodgepole pine forest type on very cold or droughty environments have been described in a few plots. The habitat types are the most harsh of the subalpine fir series (Habitat Type Group K). Limited data suggest these sites cannot support the trees per acre or basal area required to meet the minimum characteristics of the lodgepole type described above.

NORTH IDAHO ZONE:
Old Growth Type Code 3
Pacific yew forest type of cool moderately moist environments

Habitat Types, Groups, and Geographic Distribution
Grand fir habitat type phases with Pacific yew in the understory and grand fir/arrowleaf groundsel
North Idaho Zone Groups C and C1.
This type is limited in occurrence to the Nez Perce National Forest in the North Idaho Zone. These Forests also include the Clearwater and Idaho Panhandle.

Forest Types
Pacific yew

Minimum Characteristics
3 trees per acre greater than 21 inches DBH
Large trees 150 years old or more
Sample size: 26 plots

Site Description
This old growth type occupies cool, moderately moist bottomlands and toeslopes as low as 2000 feet elevation, and is on moderate to steep uplands in warm protected exposures and ridge-top benches from 4000 to 5800 feet elevation. It seldom occurs in extensive stands. Grand fir is considered to be the climax tree species, but in this old growth type, Pacific yew is dominant. It is more shade tolerant and, in the absence of fire for many years, could dominate larger areas. Protection from frequent fire by topographic or climatic factors is required for the occurrence of this type.

Vegetation Characteristics
This type may be single or multistoried. A single canopy layer occurs in climax stands, when Pacific yew forms the only tree layer. Multistoried canopies occur when Pacific yew occurs with taller grand fir, or, less frequently, late seral Engelmann spruce. This old growth type can maintain old growth characteristics for long periods in the absence of fire.

The average age of the largest trees of species other than yew in this type is 205 years, with a range from 195 to 209. Individual trees may reach an estimated age of 326 years. There are an average of 13 trees per acre 21 inches DBH or more. These are usually grand fir. The range of means across forests and forest types is 12 to 14. The average basal area is 205 ft^2 per acre.

The average number of dead standing trees 9 inches or more DBH is 5 per acre. The average percent of trees 9 inches or more DBH with dead or broken tops is 8 with a range of 7 to 10. The average percent of trees showing decay is 26, with a range of 9 to 34. The probability of rotten, down log pieces 9 inches or more in diameter is high. Average litter and duff depth is 2 to 4 inches.

Undescribed Types
Pacific yew forest type on western red cedar habitat types with Pacific yew understories (Habitat Type group G1), may occur, but very infrequently. No data are available for these sites. They are currently expected to meet the minimum characteristics described above.

NORTH IDAHO ZONE:
Old Growth Type Code 4
Douglas-fir, grand fir, western larch, Engelmann spruce/subalpine fir/western hemlock, white pine forest types
on cool, moist environments.

Habitat Types, Groups, and Geographic Distribution
All grand fir, western hemlock habitat types, western red cedar habitat types and the warmer and moister subalpine fir and mountain hemlock habitat types. Western red cedar and western hemlock habitat types with oak fern understories and grand fir with beargrass or twinflower understories are best represented.

North Idaho Zone Groups C, C1, D, E, F, G, G1, H, I
This type is well represented across all of the 3 National Forests in this zone, but grand fir habitat types are more abundant on the Nez Perce, and cedar and hemlock habitat types are more abundant on the Clearwater and Idaho Panhandle National Forest.

Forest Types
Douglas-fir and grand fir are major forest types. Western larch, ponderosa pine, Engelmann spruce/subalpine fir, western hemlock and western white pine are less well represented.

Minimum Characteristics
10 trees per acre 21 inches DBH or more
Large trees 150 years old or more
Basal area 80 ft^2 per acre or more
Sample size: 14,421ots

Site Description
This old growth type occupies moist and cool environments on all aspects and elevations from 1400 feet along stream bottoms to 7300 feet on sheltered aspects. Grand fir is the climax dominant on the driest sites, and subalpine fir and mountain hemlock on the coldest. Western hemlock and western red cedar are climax on cool sites that are more moist than those that can support grand fir, and warmer than those that can support subalpine fir. Cedar and western hemlock habitat types are the most productive and can support greater tree stocking. Prior to 1900, infrequent stand replacing wildfires favored development of long lived seral and climax stands on cedar and western hemlock sites. Moist mountain hemlock and subalpine fir habitat types also have fire intervals of 200 years or more, and a harsher environment favorable to fewer seral species. More frequent fires in grand fir habitat types favor a greater number of seral species.

Vegetation Characteristics
This type may be single or multistoried. A single canopy layer is most common in stands of pure Douglas-fir, larch or ponderosa pine. Multiple canopy layers are more common in late seral stands as climax tree species grow up beneath a seral overstory, or in climax stands with shade tolerant species in both overstory and understory. On cedar and western hemlock habitat types, Douglas-fir, grand fir, and white pine are common seral forest types. Old growth white pine has become increasingly rare due to timber harvest and mortality from blister rust. On grand fir habitat types, Douglas-fir is the most common seral forest type, but grand fir may become established immediately after disturbance on all but the driest sites. Ponderosa pine is a seral species on cedar and grand fir habitat types. Douglas-fir and western larch can occur as seral species on almost all of the habitat type groups in this old growth type. This old growth type can maintain old growth characteristics for moderate periods in forest types of seral species, and for long periods of forest types of climax species in the absence of fire.

The average age of the largest trees in this type is 210 years, with a range from 160 to 264. Individual trees of long lived species like ponderosa pine, western larch, or western red cedar may reach an age of 400 to 700 years. Larch, ponderosa pine or western hemlock forest types have an average age of more than 200 years. There are an average of 27 trees per acre 21 inches DBH or more. The range of means across forests and forest types is from 12 to 53. Ponderosa pine and larch forest types usually support the fewest large trees per acre, averaging 12 to 33. The average basal area is 210 ft^2 per acre. The range is 160 to 270 ft^2. Basal areas in the low part of the range are most often associated with larch and ponderosa pine forest types, and subalpine fir and mountain hemlock habitat type groups (Habitat Type Groups H and I).

The average number of dead standing trees 9 inches or more DBH is 14 with a range of 1 to 35. Variability is highest in the grand fir forest type. White pine forest type average 24 snags per acre because of blister rust mortality. Ponderosa pine forest types average only 7. The average percent of trees 9 inches or more DBH with dead or broken tops is 7 with a range of 0 to 28 in means across forests and forest types. Ponderosa pine and larch forest types are the most variable. The white pine forest type averages only 4 percent dead and broken tops. The average percent of trees showing decay is 12, with a range of 1 to 41. Grand fir, subalpine fir and western hemlock forest types show the greatest decay, and white pine the least. Cedar and western hemlock habitat type groups (F, G, and G1) show the most decay across all forest types. The probability of rotten down log pieces 9 inches or more in diameter is moderate in early seral stands and high in late seral or climax stands. Average litter and duff depth is 1 to 2 inches.

NORTH IDAHO ZONE:
Old Growth Type Code 5
Engelmann spruce/subalpine fir, mountain hemlock/subalpine fir forest types on cold, moist environments

Habitat Types, Groups, and Geographic Distribution
Moist subalpine fir and mountain hemlock habitat types, and the colder western hemlock and western red cedar habitat types. Subalpine fir or mountain hemlock habitat types with clintonia or menziesia in the understory are best represented.
North Idaho Zone Groups F, G, H, I
This type is well represented across all of the 3 National Forests in this zone, but is most extensive on cold subalpine fir habitat types (Group I) on the Idaho Panhandle and Clearwater National Forests. This zone includes the Clearwater, Idaho Panhandle and Nez Perce National Forests.

Forest Types
Engelmann spruce/subalpine fir, mountain hemlock/subalpine fir

Minimum Characteristics
10 trees per acre 17 inches DBH or more
Large trees 150 years old or more
Basal area 80 ft^2 per acre or more
Sample size: 4275 plots

Site Description
This old growth type occupies moist and cold environments from 4000 feet in frost pocket situations to 7300 feet on sheltered northerly aspects. Subalpine fir and mountain hemlock are the climax dominants on the coldest sites. Mountain hemlock is limited to moist cold sites from the Middle Fork of the Clearwater River and northward. Western hemlock and western red cedar are climax dominants on warmer, lower elevation sites in the northern part of the zone. Cedar and western hemlock habitat types are the most productive and can support greater tree stocking. Prior to 1900, infrequent stand replacing wildfires in moist subalpine fir habitat types at intervals of 100 years or more favored growth of the shade tolerant climax species. Frost tolerant subalpine fir, western hemlock and Engelmann spruce are also important seral species when disturbance creates opening in low lying areas that impound cold air.

Vegetation Characteristics
This type is most often multistoried. A single canopy layer can occur in stands of pure Engelmann spruce in early seral stages. Multiple canopy layers are common in late seral stands as climax tree species grow up beneath a seral overstory, or in climax stands with shade tolerant subalpine fir or mountain hemlock in both overstory and understory. Engelmann spruce is less shade tolerant, but is a common seral associate. This old growth type can maintain old growth characteristics for long periods in the absence of fire.

The average age of the largest trees in this type is 202 years, with a range from 188 to 220. Subalpine fir and spruce on wet cedar habitat types (Group F) develop rot early and seldom reach ages of more than 190 years. Individual trees of other more long lived species may reach an age of 400 to 500 years. There are an average of 39 trees per acre 17 inches DBH or more. The range of means across forests and forest types is from 34 to 51. The wettest subalpine fir habitat types (Group H) support the most large trees per acre, averaging 42 to 51. The average basal area is 184 ft^2 per acre. The range is 165 to 229 ft^2.

The average number of dead standing trees 9 inches or more DBH is 18 with a range of 6 to 36. Wet subalpine fir habitat types (Group H) average 22 snags per acre. The average percent of trees 9 inches or more DBH with dead or broken tops is 8 with a range of 5 to 36 in means across forests and forest types. Wet subalpine fir habitat types average 22 percent. The average percent of trees showing decay is 12, with a range of 5 to 28. Wet subalpine fir or western red cedar habitat types (Groups H, F) show the greatest decay, averaging 24 and 27 percent. The probability of rotten down log pieces 9 inches or more in diameter is high. Average litter and duff depth is about 2 inches.

Undescribed Types

Engelmann spruce/subalpine fir forest type on grand fir habitat types is a likely seral stage in situations where cold air is impounded. It is expected to be similar to the type described above.

NORTH IDAHO ZONE:
Old Growth Type Code 6
Whitebark pine forest type
on cold environments

Habitat Types, Groups, and Geographic Distribution
Subalpine fir and mountain hemlock habitat types
North Idaho Zone Groups I, J
This type is of limited extent on all of the 3 National Forests in this zone, but has been sampled only on the Idaho Panhandle and Nez Perce. These Forests include the Clearwater, Idaho Panhandle and the Nez Perce.

Forest Types
Whitebark pine

Minimum Characteristics
5 trees per acre 13 inches DBH or more
Large trees 150 years old or more
Basal area 60 ft^2 per acre or more
Sample size: 43 plots

Site Description
This old growth type occupies moist and dry cold upper elevation environments on all aspects at elevations from 5500 to 7600 feet or more. Subalpine fir is the climax dominant on sites too dry to support mountain hemlock. Mountain hemlock is the climax dominant on cold moist sites from the Middle Fork Clearwater River drainage and northward. Habitat types will menziesia and clintonia dominated understories (Habitat Type group I) are the most productive and can support greater tree stocking. Prior to 1900, repeated fires at intervals of less than 100 to 150 years favored the occurrence of whitebark pine stands. Fire suppression has resulted in conversion of many stands to subalpine fir and mountain pine beetle epidemics have increased fuel loadings to whitebark pine stands with increased potential for higher intensity fires.

Vegetation Characteristics
This type may be single or multistoried. A single canopy layer is most common in stands of pure whitebark pine. Multiple canopy layers are more common in stands of whitebark pine and understory trees of more shade tolerant species, like Engelmann spruce or subalpine fir. Large whitebark pine dominate these habitat types where cold and frequent fire favor its occurrence as a seral species. This old growth type can maintain old growth characteristics for short periods until it is replaced by late seral Engelmann spruce or climax subalpine fir or mountain hemlock.

The average age of the largest trees in this type is 276 years, with a range from 183 to 295. Individual trees may reach an estimated age of 500 years. There are an average of 54 trees per acre 13 inches DBH or more. The range of means across forests and forest types is from 32 to 66. Lower values in the range are associated with drier environments (Habitat Type group J). The average basal area is 138 ft^2 per acre. The range is 103 to 170 ft^2. Lower basal areas are associated with drier environments in this old growth type.

The average number of dead standing trees 9 inches or more DBH is 35 with a range of 11 to 42. The average percent of trees 9 inches or more DBH with dead or broken tops is 7 with a range of 0 to 17 in means across forests and forest types. The average percent of trees showing decay is 9, with a range of 6 to 17. The probability of rotten down log pieces 9 inches or more in diameter is moderate. Average litter and duff depth is 1 to 2 inches.

Undescribed Types
The whitebark pine forest type on harsh, high elevation habitat types (Habitat Type group K) is known to occur, but has not been sampled. This old growth type is expected to be similar to the type described above, but the minimum basal area has been described as 40 ft^2 per acre instead of 60.

NORTH IDAHO ZONE:
Old Growth Type Code 7
Western red cedar forest type
on moist environments

Habitat Types, Groups and Geographic Distribution
Western red cedar and western hemlock habitat types. Western red cedar and western hemlock habitat types with oakfern in the understory are best represented.
North Idaho Zone Groups F, G, G1
This type is well represented on the Idaho Panhandle and Clearwater National Forests and occurs on the Nez Perce National Forest primarily in the Selway River drainage. Forests in the North Idaho zone include the Clearwater, Idaho Panhandle and the Nez Perce.

Forest Types
Western red cedar

Minimum Characteristics
10 trees per acre 25 inches DBH or more
Large trees 150 years old or more
Basal area 120 ft^2 per acre or more
Sample size: 5865 plots

Site Description
This old growth type occupies moist environments from 1500 to 5500 feet elevation on all aspects and slope positions that are protected from summer drought. Western hemlock is the climax dominant on sites above about 2500 feet, in areas of adequate summer moisture from the North Fork of the Clearwater river northward. Western red cedar is the climax dominant on sites slightly more prone to summer drought or winter cold. These sites are highly productive and can grow larger trees and support higher basal areas than other habitat types in the North Idaho Zone. Infrequent stand replacing wildfires at more than 200 year intervals favor development of long lived seral and climax stands on these sites.

Vegetation Characteristics
This type may be single or multistoried. A single canopy layer is most common in stands of pure western hemlock or cedar that can develop rapidly after disturbance on favorable sites. Multiple canopy layers are more common in climax conditions where tree mortality has created openings that have filled with young trees. Large western red cedar may be a seral dominant on western hemlock sites. This old growth type can maintain old growth characteristics for long periods in the absence of fire.

The average age of the largest trees in this type is 222 years, with a range from 184 to 261. Individual trees may reach an estimated age of 800 years. There are an average of 24 trees per acre 25 inches DBH or more. The range of means across forests and forest types is from 23 to 37. The average basal area is 285 ft^2 per acre. The range is 268 to 330 ft^2.

The average number of dead standing trees 9 inches or more DBH is 12 with a range of 6 to 47. The greatest variability is in cedar habitat types with Pacific yew in the understory (Habitat Type group G1). The average percent of trees 9 inches or more DBH with dead or broken tops is 6 with a range of 5 to 36 in means across forests and forest types. Percent dead and broken tops is also most variable in cedar habitat types with Pacific yew in the understory, ranging from 10 to 36 percent. The average percent of trees showing decay is 13, with a range of 6 to 55. Highest incidence of decay is in the cedar habitat types with fern understories or with Pacific yew understories, ranging from 27 to 55 percent. The probability of rotten down log pieces 9 inches or more in diameter is low in cedar stands that develop immediately after disturbance and high in older climax stands. Average litter and duff depth is about 2 to 3 inches.

NORTH IDAHO ZONE:

Old Growth Type Code 8

Douglas-fir, western larch, Engelmann spruce/subalpine fir, mountain hemlock/subalpine fir, and white pine forest types

on cold, moderately dry environments.

Habitat Types, Groups, and Geographic Distribution

Subalpine fir and mountain hemlock habitat types with beargrass, dwarf huckleberry, blue huckleberry, beargrass, grouse whortleberry, or pinegrass understories.
North Idaho Zone Groups J
This type is moderately well represented across all of the 3 National Forests in the North Idaho Zone. These Forests include the Clearwater, Idaho Panhandle and the Nez Perce.

Forest Types

Engelmann spruce/subalpine fir, mountain hemlock/subalpine fir, and Douglas-fir are major cover types. Western larch and western white pine are minor cover types.

Minimum Characteristics

10 trees per acre 17 inches DBH or more
Large trees 150 years old or more
Sample size: 890 plots

Site Description

This old growth type occupies cold and moderately dry environments from 5100 feet in depressions where cold air is impounded to 7300 feet on warm exposures with well drained, coarse textured soils. Mountain hemlock is the climax dominant on cold, slightly moister sites from the Middle Fork Clearwater River drainage and northward. Mountain hemlock sites are slightly more productive. Subalpine fir is the climax dominant sites too dry to support mountain hemlock. Prior to 1900, repeated fires at intervals of 100 to 200 years favored the occurrence of stands or nearly pure Douglas-fir, western larch, or white pine. Subalpine fir or mountain hemlock may rapidly reestablish on mountain hemlock sites if seed is available.

Vegetation Characteristics

This type may be single or multistoried. A single canopy layer is most common in seral stands of Douglas-fir, larch or white pine. Multiple canopy layers are more common in late seral stands as climax tree species grow up beneath a seral overstory, or in climax stands with shade tolerant species in both overstory and understory. Douglas-fir, larch, and Engelmann spruce are seral on subalpine fir habitat types. Subalpine fir is the most common seral species on mountain hemlock sites, but Engelmann spruce, Douglas-fir, larch, and white pine may also occur. Douglas-fir, larch, and white pine forest types can maintain old growth characteristics for moderate periods until they are replaced by late seral Engelmann spruce or climax subalpine fir or mountain hemlock. Subalpine fir and Engelmann spruce forest types can maintain old growth characteristics for long periods in the absence of fire.

The average age of the largest trees in this type is 201 years, with a range from 164 to 275. Individual trees of more long lived species may reach an age of 400 to 500 years. Larch forest type has an average age of 226 to 237 years. There are an average of 34 trees per acre 17 inches DBHor more. The range of means across forests and forest types is from 13 to 54. The white pine forest type is most variable because of stand openings created by blister rust mortality. The average basal area is 186 ft^2 per acre. The range is 128 to 216 ft^2. The white pine forest type is highly variable.

The average number of dead standing trees 9 inches or more DBH is 23 with a range of 3 to 40. The larch forest type usually has the fewest snags (3 to 10 per acre) and the white pine forest type the most (34 to 40). The average percent of trees 9 inches or more DBH with dead or broken tops is 8 with a range of 1 to 14 in means across forests and forest types. The average percent of trees showing decay is 12, with a range of 1 to 15. The Engelmann spruce/subalpine fir and mountain hemlock/subalpine fir forest types have the highest incidence of decay, but all are highly variable. The probability of rotten, down log pieces 9 inches or more in diameter is moderate in Douglas-fir, larch and white pine forest types and high in Engelmann spruce/subalpine fir and mountain hemlock/subalpine fir forest types.

Undescribed Types

Douglas-fir, western larch, and white pine forest types are expected to occur on harsh subalpine fir, mountain hemlock, alpine larch, and whitebark pine habitat types that are near timberline. No data are available for these sites. They are currently expected to meet the minimum characteristics described above.

NORTH IDAHO ZONE:

Old Growth Type Code 9
Engelmann spruce/subalpine fir and mountain hemlock/subalpine fir forest types on very cold, harsh environments.

Habitat Types, Groups, and Geographic Distribution
Subalpine fir and mountain hemlock habitat types with woodrush understories, alpine larch/subalpine fir and whitebark pine/subalpine fir habitat types
North Idaho Zone Group K
This type is limited to the highest elevation areas of the 3 National Forests in the North Idaho Zone, but has been sampled only on the Clearwater and Idaho Panhandle National Forests. This zone includes the Clearwater, Idaho Panhandle, and Nez Perce National Forests.

Forest Types
Engelmann spruce/subalpine fir, mountain hemlock/subalpine fir

Minimum Characteristics
5 trees per acre 13 inches DBH or more
Large trees 150 years old or more
Sample size: 26 plots

Site Description
This old growth type occupies very cold and severe climates at elevations of 6000 feet in the north part of the zone to 8000 feet in the south. Snowpacks remain long into summer and trees grow deformed by snow and wind. Subalpine fir is the climax dominant on sites too dry to support mountain hemlock and at lower elevations than alpine larch and whitebark pine. Mountain hemlock is limited to moist cold sites from the Middle Fork of the Clearwater River and northward. Alpine larch/subalpine fir are incidental habitat types on the highest peaks of the Bitterroot Mountains. Whitebark pine/subalpine fir habitat types are a mosaic of timberline sites with more wind and higher snowpacks than subalpine fir habitat types. Fire suppression since 1900 has resulted in the conversion of many stands once dominated by seral whitebark pine to Engelmann spruce/subalpine fir and mountain hemlock/subalpine fir.

Vegetation Characteristics
This type is most often multistoried and trees tend to grow in clusters. A single canopy layer can occur in stands of pure Engelmann spruce, mountain hemlock or subalpine fir in early seral stages. Multiple canopy layers are common in late seral stands as climax tree species grow up beneath a seral overstory, or in climax stands with shade tolerant subalpine fir or mountain hemlock in both overstory and understory. Subalpine fir is a climax dominant on subalpine fir habitat types and seral on mountain hemlock. It usually grows in close association with whitebark pine and alpine larch on those habitat types. Mountain hemlock is climax on mountain hemlock habitat types and may rapidly reestablish on these sites after disturbance. Engelmann spruce is less shade tolerant, but is a common seral associate. This old growth type can maintain old growth characteristics for long periods in the absence of fire.

The average age of the largest trees in this type is 193 years, with a range from 190 to 195. In the limited sample, individual trees seldom reached an age of 300 years. There are an average of 79 trees per acre 13 inches DBH or more. The range of means across forests and forest types is from 77 to 81. The average basal area is 209 ft^2 per acre. The range is 176 to 223 ft^2. The number of large trees per acre and the basal area from the limited sample are higher than expected, and may not reflect the many openings in stands of this old growth type.

The average number of dead standing trees 9 inches or more DBH is 11 with a range of 11 to 13. The average percent of trees 9 inches or more DBH with dead or broken tops is 22 with a range of 21 to 23 in means across forests. This high amount of dead and broken tops is associated with snow and wind damage. The average percent of trees showing decay is 28, with a range of 13 to 35. The probability of rotten, down log pieces 9 inches or more in diameter is moderate. Average litter and duff depth is 1 to 2 inches.

WESTERN MONTANA ZONE:

Old Growth Type Code 1
Ponderosa pine, Douglas-fir, western larch forest types on moderately warm to warm, dry environments.

Habitat Type Groups and Geographic Distribution
Western Montana Zone Groups A and B.
This type is well represented across all of the four National Forests in this zone. These Forests include the Flathead, Kootenai, Bitterroot, and Lolo

Forest Types
The major forest types are ponderosa pine, Douglas-fir, and western larch. The minor forest types are lodgepole pine and spruce-subalpine fir.

Minimum Characteristics
8 trees per acre 21 inches DBH or more;
Large trees 170 years old or more;
Sample size: 4,847 plots

Site Description
This old growth type occupies moderately warm to warm, dry environments on predominantly south and west aspects on well drained, low elevation sites. Ponderosa pine is the climax dominant on the driest sites and Douglas-fir on moister sites in these groups. Bunchgrass dominated understories are on the drier sites, typically with relative low density of trees. Habitat types where shrubs dominate the understory are more moist and can support a greater density of trees. Prior to 1900, cool underburns at intervals of 15 to 25 years promoted open stands, while hotter stand replacing fires occurred at intervals of 300 years plus.

Vegetation Characteristics
This type is normally single-storied, but may vary depending on the disturbance history (wildfire, insect infestation, windthrow, etc.) of the forest stand. The exclusion of fire will tend to develop a multi-storied stand. Most forest stands with bunchgrass understories are limited in basal area due to the droughty nature of these sites. Large ponderosa pine dominate ponderosa pine habitat types under seral or climax conditions. Douglas-fir may be seral or climax dominants on the Douglas-fir habitat types. Western larch is a seral dominant on the moist Douglas-fir habitat types. This old growth type has a relatively long duration timeframe of maintaining the old growth characteristics.

The average age of the largest trees in this type is 246 years, with a range from 164 to 302. Individual trees may reach an estimated age of 650 years. There is an average of 17 trees per acre that are 21 inches DBH or more. The range of means across Forests and forest types is from 16 to 26 on habitat types with dry bunchgrass understories and 16 to 32 on habitat types with shrub understories. The average basal area is 161 ft^2 per acre for all sites. On sites with bunchgrass understories the range is 117 to 160 ft^2. On moister sites with shrub understories the range is from 126 to 329 ft^2.

The average number of dead standing trees greater than 9 inches DBH is 6, with a range of 0 to 22. The average percent of trees greater than 9 inches D.B.H with dead or broken tops is 12, with a range of 3 to 23 in means across Forests and forest types. The average percent of trees greater than 9 inches DBH showing decay is 5, with a range of 0 to 11. The probability of rotten, down log pieces greater than 9 inches diameter is low to moderate in this old growth type. Average litter and duff depth is less than 2 inches.

WESTERN MONTANA ZONE:

Old Growth Type Code 2
Douglas-fir and western larch forest types
on moderately cool, dry environments.

Habitat Type Group and Geographic Distribution

Western Montana Zone Group C.
This type is well represented across all of the four National Forests in this zone. These Forests include the Flathead, Kootenai, Bitterroot, and Lolo.

Forest types

The major forest types are Douglas-fir and western larch. The minor forest types are grand fir, Engelmann spruce-subalpine fir, and ponderosa pine.

Minimum Characteristics

8 trees per acre 21 inches DBH or more;
Large trees 170 years old or more;
Sample size: 2,505 plots.

Site Description

This old growth type occupies moderately cool and dry sites on all aspects. There are well drained, mid to low elevation sites. Understories are dominated by beargrass, pinegrass and huckleberry, with pinegrass and beargrass predominantly occurring on south and west aspects. Prior to 1900, underburns were the most frequent disturbance occurring at intervals of 40 to 60 years. Stand replacing fires occurring on a 150 plus year interval when fuel and weather conditions were permitted.

Vegetation Characteristics

This type may be single or multi-storied. Both are common, the difference being controlled by fire, site conditions and seed source. Douglas-fir is the predominant climax or seral tree species in most habitat types within this group. Grand fir predominates as a climax species when sites are somewhat more moist. Larch and lodgepole pine are seral species that are common throughout these habitat types when site conditions permit adequate sunlight and moisture. This old growth type has a relatively long duration timeframe of maintaining the old growth characteristics.

The average age of the largest trees in this type is 232 years, with a range from 191 to 285. Individual trees may reach an estimated age of 500 years. There is an average of 18 trees per acre that are 21 inches DBH or more. The range of means across Forests and forest types is from 12 to 22 trees per acre. The average basal area is 154 ft^2 per acre for all sites. The range from 128 on bunchgrass understory sites to 220 ft^2 on moister shrub understory sites.

The average number of dead standing trees greater than 9 inches DBH is 7, with a range of 2 to 37. The average percent of trees greater than 9 inches DBH with dead or broken tops is 11, with a range of 0 to 21 in means across Forests and forest types. The average percent of trees greater than 9 inches DBH showing decay is 5, with a range of 2 to 12. The probability of rotten, down log pieces greater than 9 inches diameter is moderate in this old growth type. Average litter and duff depth is less than 2 inches.

WESTERN MONTANA ZONE:

Old Growth Type Code 3
Lodgepole pine forest type
on moderately cool to cool, dry to wet environments.

Habitat Type Groups and Geographic Distribution
Western Montana Zone Groups C, D, E, F, G and H.
This type is well represented across all of the four National Forests in this zone. These Forests include the Flathead, Kootenai, Bitterroot, and Lolo.

Forest Types
The major forest type is lodgepole pine.

Minimum Characteristics
10 trees per acre 13 inches DBH or more;
Large trees 140 years old or more;
Sample size: 2,648 plots

Site Description
This old growth type spans the range of environments from moderately cool and dry to cool and wet. It occurs on all aspects and elevations on well to poorly drained sites. Lodgepole pine is the dominant tree species. Both underburns and stand replacing fires were common before 1900. Stand replacing fires occurred at intervals of 40 to more than 200 years. Understory vegetation includes beargrass, huckleberry, grouse whortleberry, clintonia, menziesia, etc.

Vegetation Characteristics
This type is predominantly single storied forest stands of lodgepole pine, resulting from past wildfire. On sites with warm and moist environments multi-storied forest stands occur. Occasional climax dominants in the forest stands that have survived past fires include: Douglas fir, grand fir, subalpine fire, spruce, western red cedar and mountain hemlock. Also associated seral dominants of western larch may be present in the forest stands. This old growth type has a relatively short duration timeframe of maintaining the old growth characteristics.

The average age of the largest trees in this type is 191 years, with a range from 150 to 221. Individual lodgepole pine trees may reach an estimated age of 300 plus years. Individual trees of climax species may reach an estimated age of 500 plus years. There are an average of 30 trees per acre 13 inches DBH or more. The range of means across Forests and forest types is from 11 to 42 trees per acre. The average basal area is 181 ft^2 per acre for all sites. The range is from 146 on a drier sites in western Montana to 212 ft^2 on moister sites.

The average number of dead standing trees greater than 9 inches DBH is 19, with a range of 0 to 92. The average percent of trees greater than 9 inches DBH with dead or broken tops is 11, with a range of 5 to 22 in means across Forests and forest types. The average percent of trees greater than 9 inches DBH showing decay is 6, with a range of 2 to 15. The probability of rotten, down log pieces greater than 9 inches diameter is high in this old growth type. Average litter and duff depth is less than 4 inches.

WESTERN MONTANA ZONE:

Old Growth Type Code 4

Engelmann spruce-subalpine fir, western redcedar, grand fir, Douglas-fir, western larch forest types on cool, moist to wet environments.

Habitat Type Groups and Geographic Distribution

Western Montana Zone Groups D, E, and F.

This type is well represented across all of the four National Forests in this zone. These Forests include the Flathead, Kootenai, Bitterroot, and Lolo. The occurrence of western larch, western redcedar, and grand fir is limited on the Bitterroot National Forest.

Forest Types

The major forest types are Engelmann spruce-subalpine fir, western redcedar, western larch, grand fir, and Douglas-fir. The minor forest types are western white pine, western hemlock, mountain hemlock-subalpine fir, ponderosa pine, and whitebark pine-limber pine.

Minimum Characteristics

10 trees per acre 21 inches DBH or more;
Large trees 180 years old or more;
Sample size: 13,867 plots.

Site Description

This old growth type occupies the range of environments from cool and dry to cool and wet. It occurs on well to poorly drained sites on all aspects and elevations. These are the most productive sites on the forests. Climax species include Douglas-fir, grand fir, Engelmann spruce, western redcedar, mountain and western hemlock, and subalpine fir. Understories are highly variable and range from beargrass on the drier sites to devils club on the wetter sites. Fires are normally light ground fires or infrequent stand replacing fires. Stand ages can range up to 350 plus years on the wetter sites.

Vegetation Characteristics

This type can be either single or multistoried; however, multi-storied stands predominate. The large dominant climax species are primarily grand fir, Engelmann spruce, western redcedar, and subalpine fir. The other dominant climax species found on some sites on the Flathead, Kootenai and Lolo are mountain and western hemlock. It is common to have residual trees that have survived a stand-replacing fire over a mixed understory of younger seral species. Seral species of western larch, lodgepole pine, Douglas-fir and western white pine are common on many sites in these habitat types and in some cases may be the dominant forest type. This old growth type has a relatively long duration timeframe of maintaining the old growth characteristics.

The average age of the largest trees in this type is 237 years, with a range from 219 to 323. Individual trees may reach an estimated age of 600 years. There is an average of 22 trees per acre that are 21 inches DBH or more. The range of means across Forests and forest types is from 2 trees per acre, on higher elevation whitebark pine forest types, to 43 trees per acre on the wet western redcedar forest types. The average basal area is 197 ft^2 per acre for all sites with a range of 111 ft^2 per acre on the whitebark pine sites, to 302 ft^2 per acre on the western redcedar site.

The average number of dead standing trees greater than 9 inches DBH is 15, with a range of 2 to 43. The average percent of trees greater than 9 inches DBH with dead or broken tops is 9, with a range of 0 to 19 in means across Forests and forest types. The average percent of trees greater than 9 inches DBH showing decay is 9, with a range of 1 to 31. The probability of rotten, down log pieces greater than 9 inches diameter is high in this old growth type. Average litter and duff depth is less than 4 inches.

WESTERN MONTANA ZONE:

Old Growth Type Code 5

Engelmann spruce-subalpine fir, grand fir, western larch, Douglas-fir forest types on moderately cool to cool, and moderately dry to moist environments.

Habitat Type Groups and Geographic Distribution

Western Montana Zone Groups G and H.

This type is well represented across all of the four National Forests in this zone. These Forests include the Flathead, Kootenai, Bitterroot, and Lolo.

Forest Types

The major forest types are Englemann spruce-subalpine fir, grand fir, western larch, and Douglas-fir. The minor forest types are ponderosa pine, mountain hemlock-subalpine fir, and whitebark pine-limber pine.

Minimum Characteristics

10 trees per acre 17 inches DBH or more;
Large trees 180 years old or more;
Sample size: 4,053 plots

Site Description

This old growth type occurs on moderately cool to cool, and moderately dry to moist sites. These sites are well drained occurring on all aspects and a wide range of elevations. Subalpine fir and Engelmann spruce are the predominant climax species on the cooler sites, with Douglas-fir and grand fir being predominate on the warmer sites. Twinflowers, huckleberry, and beargrass are among the most common understory plants. Fires are usually stand-replacing and occur at infrequent intervals of 200 plus years.

Vegetation Characteristics

This type is usually multistoried. While young stands can be single-storied, mature stands are most often multistoried with several species usually present in the stand. Growth is slow and shade tolerant species continue to regenerate over time. The dominant climax trees are subalpine fir on the cooler habitat types and grand fir on the warmer habitat types. Douglas-fir and Engelmann spruce may be a seral or climax dominant, depending on the habitat type. Western larch is a seral dominant on the more moist habitat types. This old growth type has a relatively long duration timeframe of maintaining the old growth characteristics.

The average age of the largest trees in this type is 231 years, with a range from 193 to 280. Individual trees may reach an estimated age of 600 years. There is an average of 32 trees per acre that are 17 inches DBH or more. The range of means across Forests and forest types is from 2 trees per acre on the high elevation whitebark pine forest types to 50 trees per acre on the low elevation ponderosa pine forest types. The average basal area is 176 ft^2 per acre for all sites. The basal area has a range of 107 ft^2 per acre on the drier ponderosa pine forest type, to 239 ft^2 per acre on moister subalpine fir forest type.

The average number of dead standing trees greater than 9 inches DBH is 12, with a range of 3 to 36. The average percent of trees greater than 9 inches DBH with dead or broken tops is 9, with a range of 1 to 18 in means across forests and forest types. The average percent of trees greater than 9 inches DBH showing decay is 6, with a range of 0 to 12. The probability of rotten, down log pieces greater than 9 inches diameter is high on this old growth type. Average litter and duff depth is less than 3 inches.

WESTERN MONTANA ZONE:

Old Growth Type Code 6

Engelmann spruce/subalpine fir, whitebark pine-limber pine-subalpine larch forest types on cold, moderately dry environments.

Habitat Type Group and Geographic Distribution

Western Montana Zone Habitat Type Group I.
This type is well represented across all of the four National Forests in this zone. These Forests include the Flathead, Kootenai, Bitterroot, and Lolo.

Forest Types

The major forest types are Engelmann spruce-subalpine fir and whitebark pine-limber pine-subalpine larch. The minor forest types are western larch and Douglas-fir sampled only on the Kootenai National Forest.

Minimum Characteristics

10 trees per acre 13 inches DBH or more;
Large trees 180 years old or more;
Sample size: 255 plots.

Site Description

This old growth type occupies cold and moderately dry, well drained sites at upper elevations. The most common species is subalpine fir, with Engelmann spruce, lodgepole pine and whitebark pine mixed in some stands. Fire is infrequent and fuels are comparatively light due to slow growth. Stand replacing fires are the norm; however, the interval is long, as much as 200 plus years.

Vegetation Characteristics

This type is normally multistoried for most of its cycle. Single-storied stands are not uncommon at the earlier periods, however. Regeneration is continuous and growth is slow, resulting in multi-storied, multi-aged stands. The dominate understory vegetation is grouse whortleberry and woodrush. Subalpine fir and whitebark pine are the climax species in these habitat type groups and are the dominate trees in these forest stands. Lodgepole pine is the primary seral tree occurring in this old growth type, but not the dominate tree within the forest stands. This old growth type has a medium duration timeframe of maintaining the old growth characteristics.

The average age of the largest trees in this type is 240 years, with a range from 207 to 257. Individual trees may reach an estimated age of 495 years. There is an average of 33 trees per acre that are 13 inches DBH or more. The range of means across Forests and forest types is from 16 on drier habitat types to 67 on wetter habitat types. The average basal area is 179 ft^2 per acre, with a range of 132 to 204 ft^2 as sites increase in available moisture.

The average number of dead standing trees greater than 9 inches DBH is 25, with a range of 5 to 38. The average percent of trees greater than 9 inches DBH with dead or broken tops is 11, with a range of 2 to 31 in means across forests and forest types. The average percent of trees greater than 9 inches DBH showing decay is 10, with a range of 2 to 17. The probability of rotten, down log pieces greater than 9 inches diameter is moderate in this old growth type. Average litter and duff depth is less than 3 inches.

WESTERN MONTANA ZONE:

Old Growth Type Code 7
Lodgepole pine forest type
on cold, moderately dry environments.

Habitat Type Group and Geographic Distribution
Western Montana Zone Group I.
This type is well represented across all of the four National Forests in this zone. These Forests include the Flathead, Kootenai, Bitterroot, and Lolo.

Forest Types
The major forest type is lodgepole pine.

Minimum Characteristics
30 trees per acre 9 inches DBH or more;
Large trees 140 years old or more;
Sample size: 95 plots.

Site Description
This old growth type occupies cold and moderately dry, well drained sites at higher elevations. Lodgepole pine predominates these sites due to fire history and cold temperatures. Fires are usually stand replacing and occur at infrequent intervals. Whitebark pine is sometimes associated with this type. Growth is slow, due to the short, frost-free period.

Vegetation Characteristics
This type is most often single storied, resulting from stand replacing fires, or occasional ground fires that remove other species. These types are above the cold temperature limits of Douglas-fir and western larch. The dominate understory vegetation is grouse whortleberry and woodrush. Subalpine fir is the climax species in this habitat type group, but is the minor component of these forest stands. Lodgepole pine is the dominate seral tree occurring in this old growth type. These forest stands before fire suppression were often in an open grown structure because of repeated wildfires. This old growth type has a relatively short duration timeframe of maintaining the old growth characteristics.

The average age of the largest trees in this type is 187 years, with a range from 167 to 215. Individual trees may reach an estimated age of 400 years. There is an average of 129 trees per acre that are 9 inches DBH or more. The range of means across Forests and forest types is from 202 on drier portions of western Montana to 337 on wetter sites. The average basal area is 158 ft^2 per acre, the range is 139 to 189 ft^2.

The average number of dead standing trees greater than 9 inches DBH is 17, with a range of 9 to 22. The average percent of trees greater than 9 inches DBH with dead or broken tops is 8, with a range of 3 to 14 in means across Forests and forest types. The average percent of trees greater than 9 inches DBH showing decay is 5, with a range of 0 to 11. The probability of rotten, down log pieces greater than 9 inches diameter is high in this old growth type. Average litter and duff depth is less than 2 inches.

WESTERN MONTANA ZONE:

Old Growth Type Code 8

Engelmann spruce-subalpine fir and whitebark pine-limber pine-subalpine larch forest types on cold, dry environments.

Habitat Type Group and Geographic Distribution

Western Montana Zone Group J.

This old growth type is represented in small amounts across all of the four National Forests in this zone. These Forests include the Flathead, Kootenai, Lolo, and Bitterroot. However, this type was only sampled on the Flathead National Forest.

Forest Types

The major forest types are Engelmann spruce-subalpine fir and whitebark pine-limber pine-subalpine larch.

Minimum Characteristics

20 trees per acre 13 inches DBH or more;
Large trees 180 years old or more;
Sample size: 14 plots

Site Description

This old growth type occupies cold, well drained sites predominantly above the limits of continuous forest cover. The elevation is usually greater than 7000 feet in the southern portion of the zone and 5500 feet in the northern portion. Subalpine fir and whitebark pine are the dominant species. Understories are usually dominated by grouse whortleberry, beargrass, and elk sedge. Sites where smooth woodrush dominate the understory are more productive and can support greater tree stocking. Growth is very slow and tree stocking is often spotty. Sites have short frost free periods and heavy snow packs.

Vegetation Characteristics

This type is often single storied, but can develop into a multi-storied stand depending on aspect and site conditions. Whitebark pine and subalpine fir often occur in combination on the whitebark pine-subalpine fir habitat types, but may occur as pure stands in some cases. Engelmann spruce is a seral dominant in these habitat types. Whitebark pine dominates the whitebark pine habitat type under seral and climax conditions. Alpine larch occurs in combination with subalpine fir on the Alpine larch-subalpine fir habitat type. This old growth type has a medium to long duration timeframe of maintaining the old growth characteristics.

The average age of the largest trees in this type is 230 years, with a range from 223 to 239. Individual trees may reach an estimated age of 280 years based on sample data. Leiberg, during his research on the Bitterroot National Forest, noted whitebark pine trees up to 400 years old. There is an average of 66 trees per acre that are 13 inches DBH or more. The average basal area is 181 ft^2 per acre, the range is 174 to 191 ft^2.

The average number of dead standing trees greater than 9 inches DBH is 37, with a range of 33 to 40. The average percent of trees greater than 9 inches DBH with dead or broken tops is 12, with a range of 10 to 14 in means across Forests and forest types. The average percent of trees greater than 9 inches DBH showing decay is 5, with a range of 0 to 8. The probability of rotten, down log pieces greater than 9 inches diameter is moderate in this old growth type. Average litter and duff depth is less than 2 inches.

EAST-SIDE MONTANA ZONE:
Old Growth Type Code 1
Douglas-fir cover type
on warm, very dry environments

Habitat Types, Groups, and Geographic Distribution
Douglas-fir series habitat types
East-side Montana Zone Group A.
This type is well represented across all size of the National Forests in this zone. These Forest include the Beaverhead, Custer, Deerlodge, Gallatin, Helena, and Lewis and Clark.

Forest Types
Douglas-fir

Minimum Characteristics
4 trees per acre 17 inches DBH or more
Large trees 200 years old or more
Basal area 60 ft^2 per acre or more
Sample size: 989 plots

Site Description
This old growth type occupies warm, very dry, well drained environments on predominantly southerly aspects at elevations from 4600 to 8000 feet. Two habitat types also occupy northerly aspects or bench lands at lower elevations, Douglas-fir/common juniper and Douglas-fir/Idaho fescue. Douglas-fir is the climax dominant on all these dry sites. Bunchgrass dominated understories are the least productive habitat types, typically with relatively low stocking, because of site stockability limitations. Other habitat types in this group are only slightly more productive. Prior to 1900, cool underburns at intervals of 5 to 20 years on the driest habitats and 35 to 40 years on the others in this habitat type group promoted open stands. Following fire-free periods of extended length multiple storied stands would develop setting the stage for stand replacing severe fires.

Vegetation Characteristics
This type may be single or multistoried. A single story is most common during seral stages, or in climax stands with frequent fire. Large Douglas-fir dominate all these habitat types under seral and climax conditions, and lodgepole pine is a seral dominant on some Douglas-fir/common juniper sites. Lodgepole pine is only an accidental species on Psme/Aruv and Psme/Arco habitat types, but cannot exist on the bunchgrass habitat types because of the dry, warm environment. This old growth type maintains old growth characteristics for a long duration.

The average age of the largest trees in this type is 243 years, with a range from 211 to 255. Individual trees may reach an estimated age of 500 years. There are an average of 25 trees per acre 17 inches DBH or more, with a range of means across Forests and forest type is from 21 to 34. The largest diameters were 37 inches DBH. The average basal area is 136 ft^2 per acre with a range of means of 188 to 160 ft^2, but the lowest BA was 41 ft^2.

The average number of dead standing trees greater than 9 inches DBH is 6 with a range of 4 to 18. The average percent of trees greater than 9 inches DBH with dead or broken tops is 9 with a range of 7 to 10 in means across Forests and forest type. The average percent of trees showing decay is 5, with a range of 4 to 9. The average number of rotten down log pieces per acre greater than 9 inches DBH is low to moderate. Average litter and duff depth is 1 to 3 inches.

EAST-SIDE MONTANA ZONE:
Old Growth Type Code 2
Douglas-fir cover type
on warm to cool and dry to wet environments

Habitat Types, Groups, and Geographic Distribution
Douglas-fir, spruce, and subalpine fir series habitat types
East-side Montana Zone Groups B, C, D, E, F, and H
This type is well represented across all of the 6 National Forests in this zone. These Forests include the Beaverhead, Custer, Deerlodge, Gallatin, Helena, and Lewis and Clark.

Forest Types
Douglas-fir

Minimum Characteristics
5 trees per acre 19 inches DBH or more
Large trees 200 years old or more
Basal area 60 ft^2 per acre or more
Sample size: 3439 plots

Site Description
This old growth type occupies warm to cool and dry to wet, well drained to poorly drained environments on predominantly southerly aspects at elevations from 4000 to 7800 feet. It is often on northerly aspects at lower elevations and almost exclusively on southerly aspects at higher elevations. Douglas-fir is the climax dominant on the driest sites and spruce or subalpine fir on moister sites in these groups. Douglas-fir habitat types are generally less productive than the spruce or subalpine fir habitat types. Riparian habitat types are more productive and can support greater tree stocking. Prior to 1900, cool underburns at intervals of 10 to 40 years promoted open stands, while hotter stand replacing fires occurred at intervals of 150 to more than 300 years.

Vegetation Characteristics
This type may be single or multistoried. A single story is most common during seral stages, or in climax Douglas-fir stands with frequent fire occurrence. Large Douglas-fir dominate the Douglas-fir habitat types under seral and climax conditions, and Douglas-fir is a seral dominant on spruce and subalpine fir habitat types. This old growth type maintains old growth characteristics for a moderate to long duration.

The average age of the largest trees in this type is 229 years, with a range from 185 to 292. Individual trees may reach an estimated age of 580 years. There are an average of 31 trees per acre 17 inches DBH or more. The range of means across Forests and forest types is from 25 to 41. Individual trees 37 inches DBH were recorded. The average basal area is 165 ft^2 per acre with a range of 141 to 211 ft^2. The minimum mean basal area recorded was 40 ft^2 per acre.

The average number of dead standing trees greater than 9 inches DBH is 10 with a range of 3 to 29. The average percent of trees greater than 9 inches DBH with dead or broken tops is 7 with a range of 2 to 14 in means across Forests and forest types. The average percent of trees showing decay is 6, with a range of 3 to 15. The average number of rotten down log pieces per acre greater than 9 inches DBH is low to moderate. Average litter and duff depth varies from less than 1 to more than 3 inches.

EAST-SIDE MONTANA ZONE:
Old Growth Type Code 3
Douglas-fir cover type
on cool, moist to wet environments

Habitat Types, Groups, and Geographic Distribution
Abla/Mefe and Abla/Alsi habitat types
East-side Montana Zone Group G.
This type is only represented on two of the six National Forests in this zone. These Forests include the Deerlodge and Helena.

Forest Types
Douglas-fir

Minimum Characteristics
10 trees per acre 17 inches DBH or more
Large trees 180 years old or more
Basal area 80 ft^2 per acre or more
Sample size: 18 plots

Site Description
This old growth type occupies cool, moist, moderately to poorly drained environments on predominantly northerly aspects at elevations from 6500 to 7500 feet. Subalpine fir is the climax dominant on these sites, which have understories dominated by menziesia and/or alder. Natural fir periodicity is relatively long, and fire free intervals of 350 to 400 years seem to be normal. The moist character of these sites tend to limit the opportunity for fires except for the exceptionally dry years. Severe fires tended to be stand replacing fires in those cases.

Vegetation Characteristics
This type may be single or multistoried. A single story is most common during early seral stages, but becomes multistoried as succession progresses. Douglas-fir will occasionally dominate these habitat types under seral conditions, often sharing that role with lodgepole pine. This old growth type maintains old growth characteristics for a moderate duration.

The average age of the largest trees in this type is 252 years, with a range from 217 to 287. Individual trees may reach an estimated age of 400 years. There are an average of 40 trees per acre 17 inches DBH or more. The range of means across Forests and this forest type is from 31 to 50. Largest diameters recorded were 29 inches. The average basal area is 180 ft^2 per acre with a range of 164 to 196 ft^2. Minimum basal area recorded was 80 ft^2 per acre.

The average number of dead standing trees greater than 9 inches DBH is 32 with a range of 15 to 50. The average percent of trees greater than 9 inches DBH with dead or broken tops is 8 with a range of 2 to 15 in means across Forests and forest type. The average percent of trees showing decay is 8, with a range of 6 to 10. The average number of rotten down log pieces per acre greater than 9 inches DBH is low to moderate. Average litter and duff depth is less than 2.5 inches.

EAST-SIDE MONTANA ZONE:
Old Growth Type Code 4
Ponderosa pine cover type
on warm, very dry to moist environments

Habitat Types, Groups, and Geographic Distribution
Ponderosa pine and Douglas-fir series habitat types
East-side Montana Zone Groups A, B, C, and K
This type was only sampled on 1 of the 6 National Forests in this zone, that Forest being the Lewis and Clark. The type is found on the Deerlodge in limited amounts, and on the Gallatin, Helena, and Custer although no samples were available.

Forest Types
Ponderosa pine

Minimum Characteristics
4 trees per acre 17 inches DBH or more
Large trees 180 years old or more
Basal area 40 ft^2 per acre or more
Sample size: 92 plots

Site Description
This old growth type occupies warm, very dry to moist, well drained environments on predominantly southerly aspects at elevations from 3900 to 5400 feet. Ponderosa pine is the climax dominant on the driest sites and Douglas-fir on moister sites in these groups. Bunchgrass dominated understories are the least productive, typically with relatively low stocking. Habitat types where moist site shrubs such as blue huckleberry, snowberry, or chokecherry dominate the understory are more productive because they occur on northern aspects. Prior to 1900, cool underburns at intervals of 5 to 20 years on the driest sites and 35 to 40 years on the moist sites promoted open stands. Following fire-free periods of extended length, multiple storied stands would develop, setting the stage for stand replacing fires. This old growth type maintains old growth characteristics for a moderate to long duration.

Vegetation Characteristics
This type may be single or multistoried. A single story is most common during seral stages, or in climax stands with frequent fire. Sites without fire will develop multiple stories. Large ponderosa pine may dominate these habitat types under seral and/or climax conditions depending on the habitat type. Ponderosa pine is a seral dominant on moist habitat types within this old growth type where Douglas-fir is the climax dominant. On those sites Douglas-fir will replace ponderosa pine without disturbance that periodically removes Douglas-fir. Ponderosa pine dominated stands may have a savannah look if fire has remained a component of the ecosystem or because of site stockability limitations.

The average age of the largest trees in this type is 215 years, with a range from 195 to 246. Individual trees may reach an estimated age of 450 years. There are an average of 24 trees per acre 17 inches DBH or more. The range of means across forests and forest types is from 20 to 25, with the largest diameter recorded being 29 inches. The average basal area is 126 ft^2 per acre on sites with a range of 93 to 133 ft^2. The minimum basal area recorded was 41 ft^2 per acre.

The average number of dead standing trees greater than 9 inches DBH is 7 with a range of 5 to 10. The average percent of trees greater than 9 inches DBH with dead or broken tops is 8 with a range of 5 to 10 in means across Forests and forest types. The average percent of trees showing decay is 4, with a range of 3 to 10. The average number of rotten down log pieces per acre greater than 9 inches DBH is low to moderate. Average litter and duff depth is less than 3 inches.

EAST-SIDE MONTANA ZONE:

Old Growth Type Code 5
Limber pine cover type
on warm, dry to very dry environments

Habitat Types, Groups, and Geographic Distribution
Limber pine, Douglas-fir, and ponderosa pine series habitat types
East-side Montana Zone Groups A and B
This type is only represented by 2 of the 6 National Forests in this zone. These Forests include the Helena and Lewis and Clark. The other Forests in the zone also have this type although no samples were available.

Forest Types
Limber pine

Minimum Characteristics
6 trees per acre 9 inches DBH or more
Large trees 120 years old or more
Basal area 50 ft^2 per acre or more
Sample size: 24 plots

Site Description
This old growth type occupies warm, dry to very dry, well drained environments on predominantly southerly aspects at elevations from 4400 to 8300 feet. Limber pine is the climax dominant on the driest sites where it sometimes shares that status with Douglas-fir on sites where Douglas-fir can exist. Productivity on these sites is low to very low and old growth trees rarely reach 50 feet height at best and often only 35 feet. Stockability limitations result in open stands that are poorly stocked. Soils are calcareous, and most sites have moderate amounts of bare soil and rock exposed. Natural fire occurrence was probably similar to the driest Douglas-fir sites and may have averaged 5 to 25 years. Some studies have indicated now fire occurrence for over 200 years on some sites. The open natural of the sites, the poor productivity would result in fire of low intensity and frequency.

Vegetation Characteristics
This type may be single or multistoried. A single story is most common during seral stages, or in climax limber pine stands. Limber pine dominates limber pine habitat types under seral and climax conditions, and is a seral dominant on the drier Douglas-fir habitat types. This old growth type maintains old growth characteristics for a moderate to long duration.

The average age of the largest trees in this type is 173 years, with a range from 152 to 194. Individual trees may reach an estimated age of 250 years. There are an average of 79 trees per acre 9 inches DBH or more. The range of means across Forests and forest types is from 54 to 122. The largest diameter recorded averaged 21 inches. The average basal area is 111 ft^2 per acre and the range is 72 to 173 ft^2. The minimum average basal area is 50 ft^2 per acre.

The average number of dead standing trees greater than 9 inches DBH is 12 with a range of 6 to 24. The average percent of trees greater than 9 inches DBH with dead or broken tops is 9 with a range of 0 to 14 in means across Forests and forest types. The average percent of trees showing decay is 10, with a range of 0 to 14. The average number of rotten down log pieces per acre greater than 9 inches DBH is low. Average litter and duff depth is less than 1 inch.

EAST-SIDE MONTANA ZONE:
Old Growth Type Code 6
Lodgepole pine cover type
on warm to cool, dry to wet environments

Habitat Types, Groups, and Geographic Distribution
Douglas-fir, spruce, and subalpine fir series habitat types
East-side Montana Zone Groups A, B, C, D, E, F, G, H, and I
This type is well represented across all six of the National Forests in this zone. These Forests include the Beaverhead, Custer, Deerlodge, Gallatin, Helena, and Lewis and Clark

Forest Types
Lodgepole pine

Minimum Characteristics
12 trees per acre 10 inches DBH or more
Large trees 150 years old or more
Basal area 50 ft^2 per acre or more
Sample size: 9633 plots

Site Description
This old growth type occupies warm to cool, dry to wet, well to poorly drained environments on all aspects at elevations from 4500 to 8000 feet. It is on northerly aspects at lower elevations but is found on all aspects at higher elevations. Douglas-fir is the climax dominant on the warmest, driest sites and spruce or subalpine fir are climax dominants on the more moist, cooler sites. Productivity is variable, being lowest at the dry warm and dry cold sites, but only moderate on the mesic sites. Natural fire frequency is variable because of the wide range of habitats but lodgepole pine stands may have experienced thinning fires on a 35 to 40 year frequency on some sites. Other sites have had longer fire free periods that may have been as long as 350 to 400 years, at which time a severe stand replacing fire would be normal. Setting the stage for catastrophic fire has been large amounts of dead fuel created by mortality from mountain pine attacks.

Vegetation Characteristics
This type may be single or multistoried. A single story is most common because of these stands fire related dependency. Lodgepole pine is seral on most sites, and climax only on edaphic situations. Thus old growth lodgepole pine will be replaced by more shade tolerant species barring disturbance. Lodgepole pine will remain a part of the vegetative community as succession progresses but will at length only be a minor component. This old growth type maintains old growth characteristics for a relatively short duration.

The average age of the largest trees in this type is 173 years, with a range from 144 to 223. Individual trees may reach an estimated age of 500 years. There are an average of 152 trees per acre 9 inches DBH or more. The range of means across Forests and forest types is from 89 to 191. The largest diameter tree sampled was 37 inches DBH. The average basal area is 152 ft^2 per acres with a range of 131 to 218 ft^2. The minimum basal area sampled was 40 ft^2 per acre.

The average number of dead standing trees greater than 9 inches DBH is 16 with a range of 3 to 56. The average percent of trees greater than 9 inches DBH with dead or broken tops is 7 with a range of 0 to 26 in means across Forests and forest types. The average percent of trees showing decay is 3, with a range of 0 to 18. The average number of rotten down log pieces per acre greater than 9 inches DBH is low to moderate. Average litter and duff depth is less than 3 inches.

EAST-SIDE MONTANA ZONE:
Old Growth Type Code 7
Spruce cover type
on warm, moist environments

Habitat Types, Groups, and Geographic Distribution
Spruce/ninebark habitat type
East-Side Montana Zone Group C
This type is only represented on the Gallatin National Forest in this zone.

Forest Types
Spruce

Minimum Characteristics
12 trees per acre 17 inches DBH or more
Large trees 160 years old or more
Basal area 80 ft^2 per acre or more
Sample size: 8 plots

Site Description
This old growth type occupies moist, moderately drained environments on predominantly northerly aspects at elevations from 5900 to 7000 feet. Engelmann spruce is the climax dominant tree species, and Douglas-fir is a long-lived seral species. Common snowberry and white spiraea are common associates of ninebark which dominates the shrub layer even under mature forest canopies. Soils seem to be derived from calcareous parent material but surface soils may be acidic to neutral gravelly loams to silts. Very little rock or bare soil is exposed. Natural fire periodicity is thought to be 50 to 130 years. Low and moderate intensity fires would favor lodgepole pine and Douglas-fir, while severe stand replacing fire would favor lodgepole pine, although thick-barked Douglas-fir would also likely survive. Duff depth averages 6.5 cm.

Vegetation Characteristics
This type may be single or multistoried. A single story is most common during seral stages. Large spruce and Douglas-fir dominate this habitat type under seral and climax conditions, and lodgepole pine may be a seral dominant on some sites. This old growth type maintains old growth characteristics for a relatively long duration.

The average age of the largest trees in this type is 174 years. Individual trees may reach an estimated age of 240 years. There are an average of 22 trees per acre 17 inches DBH or more. The average basal area is 173 ft^2 per acre on sites with a range of 120 to 280 ft^2.

The average number of dead standing trees greater than 9 inches DBH is 50. The average percent of trees greater than 9 inches DBH with dead or broken tops is 01. The average percent of trees showing decay is 18. The average number of rotten down log pieces per acre greater than 9 inches DBH is moderate. Average duff depth is 6.5 cm.

EAST-SIDE MONTANA ZONE:
Old Growth Type code 8
Spruce and subalpine fir cover type
on cool, moist to wet environments

Habitat Types, Groups, and Geographic Distribution
Spruce and subalpine fir series habitat types
East-side Montana Zone Groups D and E
This type is well represented across all six of the National Forests in this zone. These Forests include the Beaverhead, Custer, Deerlodge, Gallatin, Helena, and Lewis and Clark.

Forest Types
Spruce and subalpine fir

Minimum Characteristics
7 trees per acre 17 inches DBH or more
Large trees 160 years old or more
Basal area 80 ft^2 per acre or more
Sample size: 664 plots

Site Description
This old growth type occupies cool, moist to wet, moderate to poorly drained environments on predominantly northerly aspects at elevations from 5200 to 8500 feet. It is on northerly aspects and benches at the lower portion of the elevation range. The wet sites are poorly drained and often confined to stream bottoms, seeps, and other wet sites in the mountains. Typically spruce is the climax dominant at lower elevations and subalpine fir at the higher elevations. Productivity will vary from low to moderately high for Eastern Montana. Fire periodicity under natural conditions range from 90 to 350 to 400 years. The moist nature of these sites would limit the opportunity for ignition to a brief period in the summer. Most fires would tend to be small but under extreme dry conditions would be severe and stand replacing.

Vegetation Characteristics
This type may be single or multistoried. A single story is most common in stands of dense large trees that shade out smaller trees, but multistory stands are the most common condition. Large spruce dominate all the habitat types under seral and climax conditions, often sharing that status with subalpine fir at mid-elevations. At higher elevations subalpine fir becomes dominant but almost always sharing that status with spruce. Lodgepole pine and Douglas-fir are often long-lived seral codominates on these sites. This old growth type maintains old growth characteristics for a long duration.

The average age of the largest trees in this type is 215 years, with a range from 181 to 235. Individual trees may reach an estimated age of 400 years. There are an average of 34 trees per acre 17 inches DBH or more. The range of means across Forests and forest types is from 29 to 38, and the largest diameter sampled was 33 inches. The average basal area is 193 ft^2 per acre with a range of 171 to 205 ft^2. The minimum average basal area sampled was 41 ft^2 per acre.

The average number of dead standing trees greater than 9 inches DBH is 28 with a range of 0 to 44. The average percent of trees greater than 9 inches DBH with dead or broken tops is 4 with a range of 0 to 11 in means across Forests and forest types. The average percent of trees showing decay is 5, with a range of 1 to 15. The average number of rotten down log pieces per acre greater than 9 inches DBH is moderate. Average litter and duff depth is often 5 inches or greater.

EAST-SIDE MONTANA ZONE:

Old Growth Type Code 9
Spruce and subalpine fir cover type
on cool, dry to moist environments

Habitat Types, Groups, and Geographic Distribution
Spruce and subalpine fir series habitat types
East-side Montana Zone Groups F, G, H, and I
This type is well represented across all six National Forests in this zone. These Forests include the Beaverhead, Custer, Deerlodge, Gallatin, Helena, and Lewis and Clark

Forest Types
Spruce and subalpine fir

Minimum Characteristics
10 trees per acre 13 inches DBH or more
Large trees 160 years old or more
Basal area 60 ft^2 per acre or more
Sample size: 1360 plots

Site Description
This old growth type occupies cool, dry to moist, well to moderately drained environments on all aspects at elevations from 5300 to 8600 feet. At lower elevations this type is on northerly aspects but is on all aspects and ridgetops at upper elevations. Spruce or subalpine fir are the climax dominants with seral lodgepole pine also well represented. Many of the habitat types, 800 series, are above the cold limits of Douglas-fir. Productivity is low to moderate, generally corresponding with elevation; the higher elevation types have the lowest productivity. Natural fire frequency is probably 70 to 350 years with shorter period fires being patch or thinning fires. Longer period fires would result in stand replacement. Mountain pine beetle created mortality of lodgepole pine is a major factor determining the severity of fires on these sites because of potential large fuel buildups.

Vegetation Characteristics
This type may be single or multistoried. A single story is most common in a climax situation where stocking of over story trees is great enough to suppress and inhibit under story layers. Most often multiple story stands are the rule. Spruce is the climax dominant on the spruce series habitat types. Subalpine fir is the climax dominant on subalpine fir series habitat types, but often shares that status with spruce. Lodgepole pine is a major seral component in many stands. This old growth type maintains old growth characteristics for a moderate to long duration.

The average age of the largest trees in this type is 225 years, with a range from 197 to 257. Individual trees may reach an estimated age of 500 years. There are an average of 57 trees per acre 13 inches DBH or more. The range of means across Forests and forest types is from 29 to 72. The largest diameter tree sampled was 33 inches DBH. The average basal area is 183 ft^2 per acre with a range of 133 to 241 ft^2. The minimum sampled average basal area was 45 ft^2 per acre.

The average number of dead standing trees greater than 9 inches DBH is 31 with a range of 20 to 59. The average percent of trees greater than 9 inches DBH with dead or broken tops is 5 with a range of 0 to 16 in means across Forests and forest types. The average percent of trees showing decay is 8, with a range of 0 to 30. The average number of rotten down log pieces per acre greater than 9 inches DBH is low to moderate. Average litter and duff depth is one to five inches.

EAST-SIDE MONTANA ZONE:
Old Growth Type Code 10
Subalpine fir and spruce cover type
on cold, dry to moist environments

Habitat Types, Groups, and Geographic Distribution
Pial-Abla, and Laly-Abla habitat types
East-side Montana Zone Group J
This type is only represented across 3 of the 6 National Forests in this zone. These Forests include the Beaverhead, Deerlodge, and the Lewis and Clark. The type is found on the other Forests as well but samples were not available.

Forest Types
Subalpine fir and spruce

Minimum Characteristics
8 trees per acre 13 inches DBH or more
Large trees 135 years old or more
Basal area 40 ft^2 per acre or more
Sample size: 38 plots

Site Description
This old growth type occupies cold, dry to moist, well drained environments on all aspects at elevations from 8000 to 9600 feet. Subalpine fir is the climax dominant on these high elevation sites, but shares that status with spruce, whitebark pine, and subalpine larch. Productivity is very low and these sites are considered "noncommercial" for timber production. Cold, often extreme cold, results in stockability limitations and correspondingly relatively low stocking. Habitat types on northerly aspects sometimes offer more protection from the elements and can support greater tree stocking. Fire frequencies ranging from 35 to 300 years have been reported for individual sites. The lack of fuel and the precipitation accompanying thunderstorms limit fire ignition, spread, and severity. Stand replacing fires are likely to occur as a result of wind-driven fires from lower elevations sweeping into this zone. Vegetative recovery following fire or other disturbance is slow because of the short growing season and cold.

Vegetation Characteristics
This type may be single or multistoried. A single story is most common during early seral stages. Subalpine fir and spruce dominate these habitat types under seral and climax conditions in association with whitebark pine and subalpine larch. These four species are the only trees able to survive this harsh environment. Often subalpine fir can only achieve tree form in the protection of the other species. This old growth type maintains old growth characteristics for a moderate to long duration.

The average age of the largest trees in this type is 235 years, with a range from 215 to 296. Individual trees may reach an estimated age of 425 years. There are an average of 44 trees per acre 13 inches DBH or more. The range of means across Forests and forest types is from 30 to 60 and the largest tree recorded on the plots sampled was 29 inches. The average basal area is 134 ft^2 per acre with a range of 126 to 157 ft^2. Minimum basal area sampled was 41 ft^2 per acre.

The average number of dead standing trees greater than 9 inches DBH is 43 with a range of 8 to 84. The average percent of trees greater than 9 inches .DBH with dead or broken tops is 5 with a range of 2 to 7 in means across Forests and forest types. The average percent of trees showing decay is 5, with a range of 0 to 10. The average number of rotten down log pieces per acre greater than 9 inches DBH is low to moderate. Average litter and duff depth is less than 1 inch.

EAST-SIDE MONTANA ZONE:

Old Growth Type Code 11
Whitebark pine cover type
on cool, dry to wet environments

Habitat Types, Groups, and Geographic Distribution
Spruce and subalpine fir series habitat types
East-side Montana Zone Groups D, E, F, G, H, and I
This type is represented across all six National Forests in this zone. These Forests include the Beaverhead, Custer, Deerlodge, Gallatin, Helena, and Lewis and Clark

Forest Types
Whitebark pine

Minimum Characteristics
11 trees per acre 13 inches DBH or more
Large trees 150 years old or more
Basal area 60 ft^2 per acre or more
Sample size: 953 plots

Site Description
This old growth type occupies cool, dry to wet, well to poorly drained environments on all aspects at elevations from 5200 to 8500 feet. It is on northerly aspects at lowest elevations, and all aspects and ridgetops at the higher elevations. Whitebark pine dominated stands on the warmer, lower elevations are rare, but more likely on the upper elevation habitat types. Productivity is low to moderate with lowest productivity at the upper and lower elevations, and the better sites at mid-elevations. Natural fire frequency is thought to be 70 to 350 years. Longer period fires would tend to be more severe and stand replacing, while shorter periods would be thinning or small patch fires.

Vegetation Characteristics
This type may be single or multistoried. A single story is most common during late seral stages, or in stands with frequent light underburns. Multistoried stands may be common where overstory tree stocking is light at any successional stage. Whitebark pine will dominate these habitat types under seral conditions, often sharing the site with lodgepole pine. Spruce and/or subalpine fir will be the climax dominants depending on the habitat type series, although whitebark pine may remain in the stands for a long time. This old growth type maintains old growth characteristics for a relatively short to long duration.

The average age of the largest trees in this type is 217 years, with a range from 152 to 269. Individual trees may reach an estimated age of 530 years. There are an average of 46 trees per acre 13 inches DBH or more. The range of means across Forests and forest types is from 17 to 76, and the average largest diameter tree sampled was 29 inches. The average basal area is 177 ft^2 per acre with an average range of 140 to 272 ft^2. The minimum sampled average basal area was 40 ft^2 per acre.

The average number of dead standing trees greater than 9 inches DBH is 24 with a range of 0 to 65. The average percent of trees greater than 9 inches DBH with dead or broken tops is 4 with a range of 0 to 11 in means across Forests and forest types. The average percent of trees showing decay is 7, with a range of 2 to 17. The average number of rotten down log pieces per acre greater than 9 inches DBH is low to moderate. Average litter and duff depth is one to five inches.

EAST-SIDE MONTANA ZONE:
Old Growth Type Code 12
Whitebark pine cover type
on cold, dry to moist environments

Habitat Types, Groups, and Geographic Distribution
Pial-Abla, Laly-Abla, and Pial habitat types
East-side Montana Zone Group J
This type is well represented across all six of the National Forests in this zone. These Forests include the Beaverhead, Custer, Deerlodge, Gallatin, Helena, and Lewis and Clark.

Forest Types
Whitebark pine

Minimum Characteristics
7 trees per acre 13 inches DBH or more
Large trees 135 years old or more
Basal area 40 ft^2 per acre or more
Sample size: 173 plots

Site Description
This old growth type occupies cold, dry to moist, well drained environments on all aspects at elevations from 8000 to 9600 feet. Whitebark pine is the climax dominant on these high elevation sites, but shares that status with subalpine fir, spruce, and subalpine larch on moist sites. On the drier whitebark pine habitat type, whitebark pine is the only species found in appreciable quantity. Productivity is very low and these sites are considered "noncommercial" for timber production. Cold, often extreme cold, results in stockability limitations and correspondingly relatively low stocking. Habitat types on northerly aspects sometimes offer more protection from the elements and can support greater tree stocking. Fire frequencies ranging from 35 to 300 years have been reported for individual sites. The lack of fuel and the precipitation accompanying thunderstorms limits fire ignition, spread, and severity. Stand replacing fires are likely to occur as a result of wind-driven fires from lower elevations sweeping into this zone. Vegetative recovery following fire or other disturbance is slow because of the short growing season and cold.

Vegetation Characteristics
This type may be single or multistoried. A single story is most common during early seral stages. Whitebark pine dominates these sites in seral and climax conditions in association with subalpine fir, spruce, and subalpine larch. On the drier sites only whitebark pine is able to survive successfully. This old growth type maintains old growth characteristics for a long duration.

The average age of the largest trees in this type is 218 years, with a range from 190 to 286. Individual trees may reach an estimated age of 400 years. There are an average of 52 trees per acre 13 inches DBH or more, with a range of means across Forests and forest types being 30 to 77 trees per acre. The largest diameter tree sampled was 25 inches. The average basal area is 176 ft^2 per acre with an average range of 153 to 221 ft^2. The smallest average basal area sampled was 60 ft^2 per acre.

The average number of dead standing trees greater than 9 inches DBH is 17 with a range of 0 to 34. The average percent of trees greater than 9 inches DBH with dead or broken tops is 4 with a range of 0 to 16 in means across Forests and forest types. The average percent of trees showing decay is 9, with a range of 3 to 27. The average number of rotten down log pieces per acre greater than 9 inches DBH is low. Average litter and duff depth is less than 1 inch.

LITERATURE CITED

Achuff, P.L 1989. Old-growth forests of the Canadian Rocky Mountain National Parks. Natural Areas Journal. 9(i):12-26.

Arno, S.F. 1980. Forest fire history in the northern Rockies. J. of Forestry. 460-465.

Arno, S.F.; Simmerman, D.G.; Keane, R.E. 1985. Forest succession on four habitat types in western Montana. Gen. Tech. Rep. INT-177. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 74 P.

Cooper, S.V.; Neiman, K.E.; Roberts, D.W. 1991. Forest habitat types of northern Idaho: a second approximation. Gen.Tech. Rep. INT-236. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 143 P.

Daubenmire, R. 1986. Plant communities. A textbook of plant synecology. Harper and Row Publishers, NY. 300 P.

Dansereau, P. 1957. Biogeography, an ecological perspective. The Ronald Press Co. N.Y. 394 P.

Fischer, W.C.; Bradley, A.F. 1987. Fire ecology of western Montana forest habitat types. Gen. Tech. Rep. INT-223. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 95 P.

Fisher, W.C.; Clayton, B.D. 1983. Fire ecology of Montana forest habitat types east of the continental divide. Gen. Tech. Rep. INT-141. Ogden, UT. U.S. Department of Agriculture. Forest Service, Intermountain Research Station. 83 P.

Franklin, J.F.; Hall, F.; Laudenslayer, W.; Maser, C.; Nunan, J.; Poppino, J, Ralph, C.J.; Spies, T. 1986. Interim definitions for old-growth Douglas-fir and mixed-conifer forest in the Pacific northwest and California. Research Note PNW-447. Portland, OR: U.S. Department of Agriculture. Forest Service, Pacific Northwest Research Station. 7 p.

Franklin, J.F.; Spies, T.A. 1991. Ecological definitions of old-growth Douglas-fir forests. In Wildlife and Vegetation of Unmanaged Douglas-fir Forests. Gen. Tech. Rep. PNW-GTR-285. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 61-69.

Habeck. J.R. 1988. Old-growth forests in the northern Rocky Mountains. Natural Areas Journal. 8(3):202-211.

Habeck, J.R. 1990. Old-growth ponderosa pine-westem larch forests in western Montana: ecology and management. Northwest Environmental J. 6(2):271-292.

Hayward, G.D. 1991. Using population biology to define old-growth forests. Wildi.Soc. Bull. 19:111-116.

Hunter, M.L 1987. What constitutes an old-growth stand? Toward a conceptual definition of old-growth forests. J. of Forestry. 87(8):33-35.

Hunter, M.L 1990. Wildlife, forests, and forestry: principles of managing forests for biological diversity. Prentice Hall Neglewood Cliffs, NJ. 370 p.

Losensky, J.L. 1992. Personal communication. Jack Losensky, Ecologist, Lolo National Forest, Missoula, MT.

Kimmins, J.P. 1987. Forest ecology. Macmillan Publ. Co., NY. 531 P.

Marcot, B.G.; Hothausen, R.S.; Teply. J., Carrier, W.D. 1991. Old-growth inventories: status, definitions, and visions for the future. In Wildlife and Vegetation of Unmanaged Douglas-fir Forests. Gen. Tech. Rep. PNW-GTR-285. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 47-60.

Oliver. C.D.; Larson, B.C. 1990. Forest stand dynamics. McGraw-Hill, Inc., NY. 467 p.

Pfister, R.D. 1987. Old growth definition, classification and application. Contract report Nez Perce and Kootenai National Forests. Northern Region USDA Forest Service, Missoula, MT. 56 p.

Pfister. R.D., Kovalchik, B.L; Arno, S.F., Presby, R.C. 1977. Forest habitat types of Montana. Gen. Tech. Rep. INT-34. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 174 p.

Spurr, S.H. 1964. Forest ecology. The Ronald Press Co. N.Y. 352 p.

Thomas, J.W.; Ruggiero, L.F.; Mannan, R.W., Schoen, J.W.; Lancia R.A.1988. Management and conservation of old-growth forests in the United States. Wildl. Soc. Bull. 16:252-262.

USDA Forest Service RI. 1989. Timber data management handbook: stand examination procedures. Forest Service Handbook 2409.21h R-1. Missoula, MT: U.S. Department of Agriculture, Forest Service, Northern Region. 250 p.

Weaver, J.E., Clements, F.E. 1938. Plant ecology. McGraw-Hill, Inc. N.Y. 601 p.

APPENDICES

Appendix A - Habitat Type Groups for Northern Idaho, Western Montana, and Eastern Montana Idaho, North of the Salmon River (IN)

Habitat Type Group	Group Code	Alpha Code	Numeric Code
	A	PIPO/AGSP	130
		PIPO/FEID	140
		PIPO/SYAL	170
		PSME/AGSP	210
		PSME/FEID	220
	B	PIPO/PHMA	190
		PSME/PHMA	260
		PSME/PHMA-SMST	263
		PSME/PHMA-PHMA	261
		PSME/SYAL	310
		PSME/VAGL	280
		PSME/VACA	250
		PSME/CARU	320
		PSME/CARU-ARUV	322
		PSME/CARU-CARU	323
		PSME/CAGE	330
		PSME/SPBE	340
	C	ABGR/SETR	529
		ABGR/ASCA	516
		ABGR/ASCA-MEFE	518
		ABGR/ASCA-ASCA	517
		ABGR/CLUN	520
		ABGR/CLUN-MEFE	525
		ABGR/CLUN-PHMA	524
		ABGR/CLUN-CLUN	521
	CI	ABGR/ASCA-TABR	519
		ABGR/CLUN-TABR	526
	D	ABGR/LIBO	590
		ABGR/LIBO-XETE	592
		ABGR/LIBO-LIBO	591
		ABGR/VAGL	515
		ABGR/XETE	510
		ABGR/XETE-COOC	511
		ABGR/XETE-VAGL	512
		ABGR/CLUN-XETE	523
	E	ABGR/PHMA	506
		ABGR/PHMA-COOC	507

Habitat Type Group	Group Code	Alpha Code	Numeric Code
		ABGR/PHMA-PHMA	508
		ABGR/SPBE	505
	F	THPL/OPHO	550
		THPL/ATFI	540
		THPL/ATFI-ADPE	541
		THPL/ATFI-ATFI	542
		THPL/ADPE	560
	G	THPL/GYDR	555
		THPL/ASCA	545
		THPL/ASCA-MEFE	547
		THPL/ASCA-ASCA	546
		THPL/CLUN	530
		THPL/CLUN-MEFE	533
		THPL/CLUN-CLUN	531
		THPL/CLUN-XETE	534
		TSHE/GYDR	565
		TSHE/ASCA	575
		TSHE/ASCA-ARNU	576
		TSHE/ASCA-MEFE	577
		TSHE/ASCA-ASCA	578
		TSHE/CLUN	570
		TSHE/CLUN-ARNU	572
		TSHE/CLUN-MEFE	574
		TSHE/CLUN-CLUN	571
		TSHE/CLUN-XETE	573
	GI	THPL/ASCA-TABR	548
		THPL/CLUN-TABR	535
	H	ABLA/STAM	635
		ABLA/STAM-MEFE	636
		ABLA/STAM-LICA	637
		ABLA/CACA	650
		ABLA/CACA-LEGL	655
		ABLA/CACA-VACA	654
		ABLA/CACA-LICA	652
		ABLA/CACA-CACA	651
		TSME/STAM	675
		TSME/STAM-LUHI	676
		TSME/STAM-MEFE	677
	I	ABLA/CLUN	620
		ABLA/CLUN-MEFE	625
		ABLA/CLUN-XETE	624
		ABLA/CLUN-CLUN	621

Habitat Type Group	Group Code	Alpha Code	Numeric Code
		ABLA/MEFE	670
		ABLA/MEFE-LUHI	672
		ABLA/MEFE-VASC	674
		ABLA/MEFE-COOC	671
		ABLA/MEFE-XETE	673
		TSME/CLUN	685
		TSME/CLUN-MEFE	686
		TSME/CLUN-XETE	687
		TSME/MEFE	680
		TSME/MEFE-LUHI	681
		TSME/MEFE-XETE	682
		TSHE/MEFE	579
	J	ABLA/XETE	690
		ABLA/XETE-LUHI	694
		ABLA/XETE-VASC	692
		ABLA/XETE-COOC	693
		ABLA/XETE-VAGL	691
		ABLA/VAGL	720
		ABLA/CARU	750
		ABLA/VASC	730
		ABLA/VACA	640
		TSME/XETE	710
		TSME/XETE-LUHI	711
		TSME/XETE-VASC	713
		TSME/XETE-XETE	712
	K	ABLA-LUHI	830
		TSME/LUHI	840
		PICO/VACA	920
		PICO/XETE	925
		PICO/VASC	940
		LALY-ABLA	860
		PIAL-ABLA	850

Table 1. Habitat type groups for Idaho, north of the Salmon river, with habitat type alpha and numeric codes.

Montana, West of the Continental Divide (MW)

Habitat Type Group	Group Code	Alpha Code	Numeric Code
Warm and Dry	A	PIPO/AGSP	130
		PIPO/FEID	140
		PIPI/FEID-FEID	141
		PIPO/FEID-FESC	142
		PIPO/PUTR	160
		PIPO/PUTR-AGSP	161
		PIPO/PUTR-FEID	162
		PIPO/SYAL	170
		PIPO/SYAL-SYAL	171
		PSME/AGSP	210
		PSME/FEID	220
		PSME/FESC	230
		PSME/SYAL-AGSP	321
		PSME/CVARU-AGSP	311
Moderatly Warm and Dry	B	PSME/VACA	250
		PSME/PHMA	260
		PSME/PHMA-PHMA	261
		PSME/PHMA-CARU	262
		PSME/VAGL-ARUV	282
		PSME/SYAL	310
		PSME/SYAL-CARU	312
		PSME/SYAL-SYAL	313
		PSME/CARU-ARUV	322
		PSME/CARU-PIPO	324
		PSME/SPBE	340
Moderatly Cool and Dry	C	PSME/VAGL-VAGL	281
		PSME/VAGL-XETE	283
		PSME/LIBO-CARU	292
		PSME/CARU-CARU	323
		PSME/JUCO	360
		PSME/ARCO	370
		ABGR/XETE	510
		ABLA/CARU	750
Warm and Moist	D	ABGR/CLUN	520
		ABGR/CLUN-CLUN	521
		ABGR/CLUN-ARNU	522
		ABGR/CLUN-XETE	523
		THPL/CLUN	530
		THPL/CLUN-CLUN	531
		THPL/CLUN-MEFE	532

Habitat Type Group	Group Code	Alpha Code	Numeric Code
		TSHE/CLUN	570
		TSHE/CLUN-CLUN	571
		TSHE/CLUN-ARNU	572
Cool and Moist	E	PICEA/VACA	420
		ABLA/CLUN	620
		ABLA/CLUN-CLUN	621
		ABLA/CLUN-ARNU	622
		ABLA/CLUN-VACA	623
		ABLA/CLUN-XETE	624
		ABLA/CLUN-MEFE	625
		ABLA/LIBO	660
		ABLA/LIBO-LIBO	661
		ABLA/LIBO-XETE	662
		ABLA/MEFE	670
		TSME/MEFE	680
		ABLA/LUHI-MEFE	832
Wet	F	PICEA/EQAR	410
		PICEA/GATR	440
		PICEA/SMST	480
		THLP/OPHO	550
		ABLA/OPHO	610
		ABLA/GATR	630
		ABLA/GATR-GATR	631
		ABLA/GATR-CACA	632
		ABLA/CACA	650
		ABLA/CACA-CACA	651
		ABLA/CACA-GATR	653
		ABLA/CACA-VACA	654
Moderately Cool and Moist	G	PSME/LIBO	290
		PSME/LIBO	291
		ABGR/LIBO-UBO	591
		PSME/LIBO-VAGL	293
		ABGR/LIBO	590
		ABGR/LIBO-LIBO	592
Cool and Moderately Dry	H	PICEA/VACA	450
		ABLA/VACA	640
		ABLA/VACA-VACA	641
		ABLA/LIBO-VASC	663
		ABLA/XETE	690
		ABLA/XETE-VAGL	691
		ABLA/XETE-VASC	692
		TSME/XETE	710
		ABLA/VAGL	720

Habitat Type Group	Group Code	Alpha Code	Numeric Code
		ABLA/VASC-CARU	731
		PICO/VACA	920
		PICO/LIBO	930
		PICO/VASC	940
Cold and Moderately Dry	I	ABLA/VASC	730
		ABLA/VASC-VASC	732
		ABLA-PIAL/VASC	820
		ABLA/LUHI	830
		ABLA/LUHI-VASC	831
Cold	J	PIAL/ABLA	850
		PIAL	870
		LALY/ABLA	860

Table 2. Habitat type groups for Montana, west of the Continental Divide, with habitat type, alpha and numeric codes.

Habitat Type Group	Group Code	Alpha Code	Numeric Code
Warm and Very Dry	A	PIFL/AGSP	091
		PIFL/FEID	092
		PIFL/FEID-FEID	093
		PIFL/FEID-FESC	094
		PIFL/JUCO	095
		PIPO	100
		PSME/AGSP	210
		PSME/FEID	220
		PSME/FESC	230
		PSME/SYAL-AGSP	311
		PSME/CARU-AGSP	321
		PSME/ARUV	350
		PSME/JUCO	360
		PSME/ARCO	370
		PSME/SYOR	380
Warm and Dry	B	PSME/CARU	320
		SME/CARU-ARUV	322
		PSME/CARU-CARU	323
		PSME/CARU-PIPO	324
		PSME/CAGE	330
		PSME/SPBE	340
Warm and Moist		CPSME/VACA	250
		PSME/PHMA	260
		PSME/VAGL-ARUV	282
		PSME/PHMA-PHMA	261
		PSME/PHMA-CARU	262
		PSME/SYAL	310
		PSME/SYAL-CARU	312
		PSME/SYAL-SYAL	313
		PICEA/PHMA	430
Cool and Moist	D	PSME/VAGL	280
		PSME/VAGL-VAGL	281
		PSME/LIBO	290
		PSME/LIBO-SYAL	291
		PSME/LIBO-CARU	292
		PSME/LIBO-VAGL	293
		PICEA/LIBO	470
		PICEA/SMST	480
		ABLA/LIBO	660
		ABLA/LIBO-LIBO	661
		ABLA/LIBO-XETE	662
		ABLA/LIBO-VASC	663

Habitat Type Group	Group Code	Alpha Code	Numeric Code
Cool and Wet	E	PICEA/EQAR	410
		PICEA/GATR	440
		ABLA/CLUN	620
		ABLA/GATR	630
		ABLA/CACA	650
		ABLA/CACA-CACA	651
		ABLA/CACA-GATR	653
		ABLA/LEGL	???
		ABLA/VAOC	???
Cool and Dry to Moist	F	PICEA/VACA	450
		ABLA/VACA	640
		ABLA/XETE-VAGL	691
		ABLA/XETE-VASC	692
		ABLA/XETE	690
		ABLA/VAGL	720
		ABLA/VASC-CARU	731
		ABLA/VASC-VASC	732
		ABLA/VASC-THOC	733
		ABLA/VASC	730
Cool and Moist to Wet	G	ABLA/MEFE	670
Warm to Cool and Dry	H	PICEA/SEST	460
		ABLA/CARU	750
		ABLA/CLPS	770
		PICEA/SEST-PSME	461
		PICEA/SEST-PICEA	462
		ABLA/ARCO	780
		ABLA/CAGE-CAGE	791
		ABLA/CAGE-PSME	792
		ABLA/CAGE	790
Cold and Dry to Wet	I	ABLA/RIMO	810
		ABLA-PIAL/VASC	820
		ABLA/LUHI	830
		ABLA/LUHI-VASC	831
		ABLA/LUHI-MEFE	832
Cold and Dry	J	PIAL-ABLA	850
		LALY-ABLA	860
		PIAL	870

Table 3. Habitat type groups for Montana, east of the Continental Divide, with habitat type, alpha and numeric codes.

Appendix B - Old Growth Definition Correlation Notes
Old Growth Correlation Meeting Notes - June 11, 1991; Spokane. WA
with Additions from October 4, 1991 meeting in Missoula, MT. R6-RO-Portland

Attendees			
Wendel Hann	R1-RO-Missoula	W.HANN:ROIA	FTS 585-3214
John Joy	R1-Deerlodge NF	J.JOY:ROlFO9DO2A	406-287-3223
Ernie Meisenheimer	R6-Olympic NF	E.MEISENHEIMER:RO6 F09A	FTS 390-2354
Dick Shaffer	R6-RO-Portland	RSHAFFER:RO6C	FTS 423-2953
Doug Eggers	R4-Bridger-Teton NF	D.EGGERS:R04FO3A	307-739-5519
Glen Jacobsen	R4-Payette NF	G.JACOBSEN:RO4Fl2A	208-634-1421
Dean Sirucek	R1-Flathead NF	D.SIRUCEK:RO1FI0A	406-755-5401
Jack Losensky	R1-Lolo NF	J.LOSENSKY:ROIF16A	FTS 329-3819
Dwane Van Hooser	INT. Res. Sta. Ogden	D.VANHOOSER:S22L02 A	FTS 586-5388
Paul Harrington	R1-Idaho Panhandle	P.HARRINGTON:ROIF04 A	208.-765-7411
Tom High	R6-Mt. Hood NF	T.HIGH:R06F06A	503-666-0670
Ron Hamilton	R4-RO-Ogden	R.HAMILTON:R04A	FTS 586-5525
Bob Naumann	R1-RO-Missoula	B.NAUMANN:ROIA	FTS 585-
Jay Berube	R6-Colville NF	J.BERUBE:RO6F21A	509-684-3711
Len Volland*	R6-RO-Portland	L.VOLLAND:R6/PNW	
Clint Williams*	R6-RO-Portland	C.WILLIAMS:R6F	

*Attended meeting in Missoula, MT with Wendel Hann and Bob Naumann to follow up on Spokane Meeting.

Objective - to correlate old growth definitions and explain differences for types with the same name relative to ecosystem characteristics.

Old growth types are named using the standard SAF types as directed by the Washington Office.

Standard elements for correlation of types:

a) live trees in main canopy
- number of trees per acre greater than a specified DBH
- age of largest trees in main canopy
- variation in tree diameter

b) number of standing dead trees per acre
c) number of down pieces of wood per acre
c) trees per acre with decadence or decay
c) number of tree canopies (layers)

Old Growth Type Correlations

Mountain Hemlock-Alpine Larch Type (SAF 205) - R1/R6
R6 hasn't completed analysis yet. Western Washington mountain hemlock old growth is in a very different environment and disturbance regime from that in eastern Washington and northern Idaho. R6 will zone this type into westside and eastside types. R6 will use RI's definition for their eastside mountain hemlock.

Western Larch Type (SAF 212) - RI/R4/R6
Minor type in R6. R4 and R6 will use RI definition.

Lodgepole Pine Type (SAF 218) - RI/R4/R6
R6 only described this type where it is climax. RI described as old growth where it was both seral and climax. Wallowa-Whitman NF probably doesn't have much old growth lodgepole. R4 will go with RI definition. R6 will use the RI definition for seral lodgepole in eastern Washington and eastern Oregon.

Western Yew Type (SAF --) - RI/R6
R6 hasn't described the western yew type yet. R6 will use the RI definition.

Ponderosa Pine Type (SAF 237) - RI IR4/R6
RI, R4, and R6 are all close on definition criteria so will use the RI definition.

Spruce and Subalpine Fir Type (SAF 206) - RI /R4/R6
RI, R4, and R6 are all close on definition criteria so will use the RI definition.

Douglas-fir Type (SAF 210),- RI /R4/R6
RI and R4 definitions correlate. R6 only developed a coastal and interior definition for climax Douglas-fir and did not deal with seral Douglas-fir. R6 will use the RI definition for seral Douglas-fir in eastern Washington and eastern Oregon.

Grand Fir Type (SAF 213) - RI/R4/R6
RI and R6 agree for the R6 low site definition, which we could explain by RI sites being comparable ecologically to R6 low sites. However, the disagreement could also be related to the difference between climax and seral old growth grand fir. RI and R4 don't agree, but this can be explained by differences in environments in R4. R6 will use the RI definition for grand fir in eastern Washington and eastern Oregon.

Western Hemlock Type (SAF 224) - RI/R6
R6 will zone this type into westside and eastside and use RI's definition for their eastside.

Westem Redcedar-Western Hemlock Type (SAF 227) - RI/R6
R6 will zone this type into westside and eastside and use RI's definition for their eastside.

Western Redcedar Type (SAF 228) - RI/R6
R6 will zone this type into westside and eastside and use RI's definition for their eastside.

Western While Pine Type (SAF 215) - RI /R6
This type is not significant in either RI or R6 due to blister rust.

Whitebark Pine Type (SAF 208) - R1 /R4/R6
R4 and R6 will use the RI definition.

Aspen Type (SAF 217) - RI/R4
RI will use the R4 definitions

Cottonwood-Willow Type (SAF 235) - RI /R4
RI will use the R4 definition.

Limber Pine Type (SAF 219) - RI/R4
RI will use the R4 definition.

Rocky Mt Juniper Type (SAF 239) - RI/R4
RI will use the R4/R3 definition.

10/11/89

POSITION STATEMENT ON
NATIONAL FOREST OLD GROWTH VALUES

The Forest Service recognizes the many significant values associated with old growth forests, such as biological diversity, wildlife and fisheries habitat, recreation, aesthetics, soil productivity, water quality, and industrial raw material. Old growth on the National Forests will be managed to provide the foregoing values for present and future generations. Decisions on managing existing old growth forests to provide these values will be made in the development and implementation of forest plans These plans shall also provide for a succession of young forests into old growth forests in light of their depletion due to natural events or harvest.

Old growth forests encompass the late stages of stand development and are distinguished by old trees and related structural attributes. These attributes, such as tree size, canopy layers, snags, and down trees, generally define forests that are in an old growth condition. The specific attributes vary by forest type. Old growth definitions are to be developed by forest type or type groups for use in determining the extent and distribution of old growth forests.

Where goals for providing old growth values are not compatible with timber harvesting, lands will be classified as unsuitable for timber production. Where these goals can be met by such measures as extending the final harvest age well beyond the normal rotation or by using silvicultural practices that maintain or establish specific old growth values, lands will be classified as suitable for timber production. In making these determinations, consideration shall be given to the extent and distribution of old growth on National Forest lands that are Congressionally or administratively withdrawn from timber harvest, as well as adjacent ownerships.

Old growth values shall be considered in designing the dispersion of old growth. This may range from a network of old growth stands for wildlife habitat to designated areas for public visitation. In general, areas to be managed for old growth values are to be distributed over individual National Forests with attention given to minimizing the fragmentation of old growth into small isolated areas. Old growth on lands suitable for timber production and not subject to extended rotations is to be scheduled for harvest to establish young stands which more fully utilize potential timber productivity and also meet other resource objectives.

Regions with support from Research shall continue to develop forest type old growth definitions, conduct old growth inventories, develop and implement silvicultural practices to maintain or establish desired old growth values, and explore the concept of ecosystem management on a landscape basis. Where appropriate, land management decisions are to maintain future options so the results from the foregoing efforts can be applied in subsequent decisions. Accordingly, field units are to be innovative in planning and carrying out their activities in managing old growth forests for their many significant values.

GENERIC DEFINITION AND DESCRIPTION OF OLD GROWTH FORESTS

10/11/89

Purpose and Scope

The following describes the ecologically important structural features of old growth ecosystems. Measurable criteria for these attributes will be established in more specific definitions for forest types, habitat types, plant associations or groupings of them. The intent of the generic definition is to guide design of specific definitions and new inventories that include measurement of specific attributes. Although old growth ecosystems may be distinguished functionally as well as structurally, this definition is restricted primarily to stand-level structural features which are readily measured in forest inventory.

Definition

Old growth forests are ecosystems distinguished by old trees and related structural attributes. Old growth encompasses the later stages of stand development that typically differ from earlier stages in a variety of characteristics which may include tree size, accumulations of large dead woody material, number of canopy layers, species composition, and ecosystem function.

Description

The age at which old growth develops and the specific structural attributes that characterize old growth will vary widely according to forest type, climate, site conditions and disturbance regime. For example, old growth in fire-dependent forest types may not differ from younger forests in the number of canopy layers or accumulation of down woody material. However, old growth is typically distinguished from younger growth by several of the following attributes:

1. Large trees for species and site.
2. Wide variation in tree sizes and spacing.
3. Accumulations of large-size dead standing and fallen trees that are high relative to earlier stages.
4. Decadence in the form of broken or deformed tops or bole and root decay.
5. Multiple canopy layers
6. Canopy gaps and understory patchiness.

Compositionally, old growth encompasses both older forests dominated by early seral species, such as fire-dependant species, and forests in later successional stages dominated by shade tolerant species. Rates of change in composition and structure are slow relative to younger forests. Different stages or classes of old growth will be recognizable in many forest types.

Sporadic, low to moderate severity disturbances are an integral part of the internal dynamics of many old growth ecosystems. Canopy openings resulting from the death of overstory trees often give rise to patches of small trees, shrubs, and herbs in the understory.

Old growth is not necessarily 'virgin' or 'primeval.' Old growth could develop following human disturbances.

The structure and function of an old growth ecosystem will be influenced by its stand size and landscape position and context.

FOREST SERVICE OLD GROWTH TASK GROUP

Draft Action Plan

2/15/89

1. Develop a generic definition of ecological old growth. It will identify characteristics for which measurable criteria would be established in more specific definitions for forest types, habitat types, or plant associations; and would help guide the design of new inventories that will include the measurement of old growth attributes.

Responsibility: Jerry Franklin and Tom Speis, PNW

Timeframe: First draft by February 21. WO-TM will send out to Task Group members, Regions, and Stations for review. Task group will consult with other agencies and national interest groups. Final by March 23.

2. Regional definitions of ecological old growth for specific forest types, habitat types, or plant associations will be developed within the framework of the generic definition. Definitions for those vegetative classes which occur in more than one Region should be developed with coordination between the applicable Regions.

Responsibility: Regional Foresters, All Regions

Timeframe: Begin after generic definition is final.

3. Conduct long-term inventories that measure ecological old growth in accordance with the Regional definitions using the best available technology -- this will be done on both the national forests and on the other land ownerships inventoried by Forest Service FIA units. For national forest lands, these inventories will include maps of existing ecological old growth. For all the land ownerships, they will include estimates of the acreage of forest lands that will develop the characteristics of ecological old growth within the next 50 years.

Responsibility: Regional Foresters and Station Directors

Timeframe: In accordance with inventory schedule.

4. Complete forest plans in Regions 5 and 6 based on existing Regional Guide definitions, but update information on old growth to FY 1988 to the extent possible and practicable prior to release of the final plans.

Responsibility: Regional Foresters, R-5 and R-6

Timeframe: By time of release of final plans

5. Final forest plans in Regions 5 and 6 will clearly distinguish between the old growth classification as defined in the Regional Guides and the interpretations for specific resource use, such as wildlife habitat or large sawtimber. In these plans, when projecting conditions through the fifth decade, estimates should be made to the degree possible of the additional area which is likely to succeed into an old growth condition and of projected depletions resulting from timber harvest or other events.

Responsibility: Regional Foresters, R-5 and R-6

Timeframe: By time of release of final plans

Draft Old Growth Action Plan - 2/15/89 Page 2.

6. The FEIS's for the final Forest Plans which have not yet been approved for printing by the Regional Forester will document the old growth estimates published by other organizations and explain how and why they differ from Forest Service estimates.

Responsibility: Regional Foresters. R-5 and R-6

Timeframe: By time of release of final plans

7. Provide testimony for FY90 appropriations hearings that explains how the FY89 old growth inventory appropriation was used and presents the Forest Service's strategy for future old growth inventory. Develop options for further accelerating old growth inventory nationally.

One common paper for the testimony will be developed jointly by R-5, R-6, PNW, and PSW. A map of old growth will be prepared for one Forest in each of R-5 and R-6. The paper will include a description of how we will work with interest groups in the future in assessing old growth.

Responsibility: R-6 (Lead), R-5, PNW, PSW, WO-TM, and WO-Research.

Timeframe: By April 1, 1989

8. Only one estimate of old growth per Region will be displayed in RPA, and this will be based on the Regional definitions of old growth. This will be distinguished from estimates of forest lands meeting late seral stage habitat needs for wildlife.

Responsibility: WO Staff Directors - TM, WL&F, and RPA

Timeframe: By March 24, 1989

9. The national old growth task group will continue. Its responsibility will include both internal coordination and coordination with other agencies and interest groups at the national level. Regions will provide similar leadership at the Regional level. The TM staffs will serve as clearing houses for current information on old growth.

Responsibility: Deputy Chief, NFS and Regional Foresters

Timeframe: Continuing

10. Develop an information strategy paper that will clarify issues related to controversy over Forest Service management of old growth and include a proposed public information action plan that will help resolve the identified issues. It will address research efforts as well as NFS management.

Responsibility: Director, WO-PAO and Director, Region 6 PAO

Timeframe: Draft by March 24. Draft to be reviewed by task group members and final prepared by April 14.

11. Develop direction on discussion and analysis of ecological old growth in NFMA planning. The direction will be included in FSM 1920 and FSH 1909.12.

Responsibility: Director, WO-LMP

Timeframe: Draft for presentation to task group by May 1.

Appendix D - Northern Region Action Plan

ACTION PLAN: **The Regional Old Growth Committee has revised the action plan (5/90) to accomplish the Chief a objectives and continue the old growth strategy for the Region.**

	ACTION	DATE	RESPONSIBILITY RO/Forest
1.	Initiate analysis to develop definitions Form zone OG Teams for Eastside forests, Western Montana forests, and northern idaho forests	1/90	Hann/Zone OG ID Teams
2.	Initiate public involvement	3/90	Forests
3.	Evaluate inventory procedures	3/90	Hann/Naumann/Deden
4.	Complete draft definitions & descriptions	7/90	Hann/Zone OG ID Teams
5.	Correlate definitions between zones	7/90	Hann/Zone Representatives
6.	Coordinate definitions with adjacent Regions	8/90	Naumann
7.	Initiate development of old growth management strategies (Deferred for SES analysis)	8/90	Subcommittee (Naumann will coordinate)
8.	Develop guidelines for integrating definitions, inventories, and management strategies into the Forest Plan process (Deferred for SES analysis)	9/90	Prather/Forest Planners
9.	Field work to fill data gaps for definitions	7-10/90	Forest Inventory
10.	Write a chapter on old growth for the Effects Analysis Handbook (Deferred for SES analysis	8-10/90	Subcommittee (Prather/Hann will coordinate)
11.	Analyze data for old growth definitions	10/90 - 4/91	Hann/Zone OG ID Teams
12.	Identify values for each old growth type (Deferred for SES analysis)	8/90 – 4/91	Subcommittee (Davis will coordinate)
***	Correlate definitions between zones	5/91	Hann/Zone Reps
***			
***			
***			
***			
***			
***			
***			
***			
***			
***			
***			
***			
***			
***			
13.			
14.	Coordinate definitions with adjacent Regions	6/91	Naumann
15.	Complete summary report on old growth	9/30/91	Naumann-OG Committee Zone OG Committees